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Wisdom is humble that he knows no more.'—COWPER.

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COMING MEN.

II. MR. C. H. MOORE.

(Secretary of the West Yorks District Union and its Representative on the Executive of the N.U.T.; Secretary and Treasurer of the Assistants' National Committee; Thrice-elected President of the Halifax Assistants' Association.)

IT was at the Sheffield Assistant Teachers' Conference, in January 1892, that I first came across Mr. C. H. Moore, but long before then this doughty champion of the Assistant was known to me by his clever letters to the 'Schoolmaster.' When we gathered in common council at the great city of cutlery, we met face to face many gentlemen who have since, to use an expression of Leonidas Smiley, Esq., made names for themselves on the pedagogic hustings and elsewhere.

There, too, we hob-nobbed with luminaries who were already known to the great ones of Russell Square. Of those who have since been elected to the Executive, Mr. Moore stands in the front rank *primus inter pares*. This man, who blossomed forth at Sheffield, is smart in appearance, tall, slim, but wiry—a kind of Casca. His sharp and well-formed features, with prominent forehead, indicate the ready and powerful intellect enshrined within. He is withal a young man brimful of energy, dashing yet skilful in debate. As a speaker he is incisive and logical, very earnest and full of business, with emphatic and decisive views. More than all he is no trimmer.

As such did the since-chosen of West Yorkshire stage it at the first conference of the subalterns of the primary teachers. Since then Mr. Moore has put on fame by his consistency as a Unionist, and by his unflinching advocacy of a higher status for the Certificated Assistant. Witness his speeches at the Nottingham and Liverpool gatherings. No apology is needed for our giving him a place in our gallery of honour. Knowing that I was about to lionize him, a well-known assistant who has smoked pipes with fellow delegates at three conferences, scratched me the following note, which so precisely echoes my sentiments that I submit it unclipped:—

'No visitor to the Assistant Teachers' Conferences at Sheffield and Nottingham could fail to regard Mr. Moore as a very conspicuous figure. His genial, business-like, earnest, and emphatic manner, the alertness with which he met each incident and emergency, and the dignity which his method gave to each position he took, stamped him as a fitting leader, even in ranks where the keenness of youthful criticism was ever present. It is not easy to forget Moore's stand on the crucial question of the Nottingham meeting—the Federation of Assistants' Associations. The Federationists were unmistakably outnumbered, but when the Halifax President arose and flashed upon Conference with all the concentrated force of his telling vitality, trenchant diction, and incisive argument, his stoutest opponents must have felt some fear as to the issue, and much respect for the soundness of the speaker's position.'

I, by permission of our enterprising editor, proceeded to arrange a meeting with the busy Unionist, whereat I put divers and sundry questions to him after the manner (*sic*), more or less, of the extra special reporter. I ought to say it was not easy to buttonhole this man, for after school hours he is ever and anon afoot, one week end on the stump as the evangelist of the West Yorks District Union, another seated with the soothsayers and those wise-in-counsel round the board at Russell Square; and yet another, peradventure, away to attend a meeting of those who watch the Half-time questions. But I did at last waylay him, not in vain, and then I improved the shining hour to the following tune:—

'Oblige me first of all, my good friend, with a word or two as to your antecedents.' With a happy twinkle of the eye, Mr. Moore proudly began by stating that he was a Yorkshireman.

'I was born at Dewsbury, Yorkshire, some twenty-six years back, and, after passing through the Carlton Street Board School in that town, became a pupil teacher at the same place under J. G. Hefford, Esq., B.A., who is now the Inspector to the Huddersfield School Board. Afterwards I put in some time as an assistant at a rural school under the Kirton-in-Lindsey Board, Lincolnshire. About five years ago I returned to Yorkshire and accepted a post under the Halifax School Board as an Untrained Certificated Assistant.'

BRITISH MUSEUM

'Thank you very much. And now as you are one of the pioneers of organised Assistants' Representation, I should like to hear you on that subject. Did you not do great service in inaugurating the Annual Conferences of Assistants?' 'Well, perhaps I did do a little. There were a few of us who worked together—Sinclair (Sheffield), Hardy (Leeds), and Verity (Bradford), were some of my colleagues at the time. Feeling that the Certificated Assistants of the country were labouring under many grievances, and knowing that the great bulk of them were outside the Union, we determined to rouse our brethren, and so we preached a crusade, so to speak, and the upshot of it all was that a *bonâ fide* Assistants' Conference was held in Sheffield on Jan. 16th, 1892, to which delegates came from as far south as Bristol and London, and as far north as Gateshead.' I smiled. 'Why,' broke in my friend, 'of course you were there, were you not?'

'It will be interesting to learn what offices a full-blooded enthusiast like you hold,' quoth I. Here, drawing a long breath, he held forth so: 'I am President of the Halifax Assistant Teachers' Association for the third time, member of the committee of the local branch of the N.U.T., Secretary of the West Yorks District Union, Secretary and Treasurer of the Assistant Teachers' National Committee, Member of the Half-time Council, Representative of the W.Y.D.U. on the Executive of the N.U.T.'

'Sacred Neptune, you amaze me! How can you keep that lot underway? You have no time for press work I should think?'

'Well, a little; I have written for the "Schoolmaster" and "Teachers' Aid," and have done some educational work for a local paper. At present I edit the organ of the West Yorks District Union, a small monthly pamphlet.'

'One more question and I've done. As you are a coming educationalist, plank down your platform. That you'll gladly do, as I guess you don't anticipate ratting. Now show your hand. Why that beam?'

Then C. H. switched on the current and this is what he said:

'You are almost blunt enough to pass muster as a fellow-countyman. A ponderous order, friend, but here you are. Firstly, I put all my money, so to speak, on the N.U.T. The Union can do more for the teacher than aught else. Intermittent Inspection, Field Grants, Superannuation, and the raising of the position of the Certificated Assistant, *tout cela va sans dire*. I believe in a wide extension of the District Union principle, but at the same time there must be more uniformity and a better connection between the sub-unions and the central office, especially on the score of executive representation and the disbursement of the funds. I have great faith in manipulating the press. My views are somewhat advanced, perhaps. I would hob-nob with our fellow-workers rather than with those who neither toil nor spin. Marshall Jackman and I have common views on the sacred right of the Schoolmaster to exercise his rights of citizenship. Let us close our ranks as the lawyers have, and within let us dwell together in unity. Let there be one road to the teacher's diploma, but since the Government has sanctioned two, do not let us fight over the matter.

'At Liverpool I was pleased to help the vigorous Age and Attendance champion quash an abortive attempt on the part of some so-called independently trained teachers to run a separate organisation.'

These last few words were hurriedly said as we journeyed to the station. The train cut short our chat and separated us as I thanked this hardest of workers for his courtesy, and shouted *au revoir*.

ELEMENTARY LESSONS IN HORTICULTURE.

BY PROFESSOR J. R. GREEN, M.A.,
Examiner in Botany to the University of Cambridge, and
F. L. GREEN,
Late Science Mistress in the Clifton High School.

V.—Soils: Digging, Draining, Potting.

We are now in a position to see of what materials the plant makes use in the processes of nutrition, and to examine in some little detail the sources from which the store of plant-food necessary to vegetable life is obtained.

First let us try to ascertain the substances that are contained in a full-grown plant. We shall see that, various as they are, they may all be grouped under three heads. That a plant contains water may be easily seen by the simple experiment of placing a freshly gathered specimen under a glass. In a few minutes the surface of the tumbler will be covered with condensed vapour. Plants differ greatly in the amount of water they contain. A turnip contains as much as 90 per cent., while the straw of a wheat crop will yield only about 12 or 14 per cent. of water. A plant dried in an oven and thus deprived of the water contained in it will be found to have lost a large part of its weight.

On taking our dried plant from the oven we shall find that if it now be laid on a red-hot surface—such as the lid of a kitchener—it will at first burn with a bright flame, leaving a black charcoal-looking mass. Finally, however, nothing is left but a small quantity of grey or reddish ash. The portion of dry matter that has been burned away is what is called the organic matter of the plant. Under this head are comprised the three classes of bodies which we have seen in our consideration of germination are contained in seeds, viz., carbo-hydrates, albuminoids, and oils or fats. We have seen that certain carbo-hydrates, starch, sugar, and cellulose, have important functions to perform in the economy of the plant. Other carbo-hydrates found in plants are a gummy substance, *dextrin*, often found associated with sugar in the sap of young plants; *mucilage*, which takes the place of starch in some seeds, *e.g.* those of the flax; and *pectin*, which is found in most fruits, forming a vegetable jelly when the fruit is boiled with water. Albuminoids, it will be remembered, are nitrogen-containing material, and form a necessary part of human food. Oils or fats are generally found in small quantities in the leaves and stems of plants, and often, as we have seen in the case of the castor-oil plant, a large quantity is stored in the seed.

Passing now to the consideration of the *ash* or fixed matter of the plant, as distinguished from the volatile or organic matter which can be driven off by heat, we come to the important point that the

minerals contained in the small residue of ash left after the process of burning are derived only from the soil in which the plant is grown. We have in consequence to consider whether all the mineral ingredients found in plant-ash are necessary to their growth, and if not, which of them are essential to the fulfilment of this purpose, and we have also to see which of the necessary ingredients may run short in the soil and necessitate resort to the artificial supply of such elements of plant-ash.

The necessary mineral ingredients of plants may be determined by a course of simple experiments, either with artificial soils or by growing seedlings in prepared water in which have been dissolved all but one in turn of the substances it is desired to test. It will then be seen that potash, lime, magnesia, phosphoric acid, sulphur trioxide, and a minute quantity of iron are necessary to a plant's growth. A few other substances, such as silica, common salt, and chlorine, are only necessary in very minute quantities to a few special crops.

Now let us ask ourselves from what sources come the three classes of substances which we have found to be contained in a full-grown plant. In other words, what are the sources of plant-food? Reverting to the functions of the leaves, considered in the preceding chapter, we shall see at once that the atmosphere forms an important source of plant food. These organs, it has been shown, have the power of decomposing the carbonic dioxide contained in the air, of restoring the oxygen to the air, and of utilising the carbon retained for the service of the plant.

Faithfully yours.
C. H. Moore

The minerals which we have found to be necessary to plant-life are solid substances found in various forms of combination in the soil; but, as we have seen in our consideration of the functions of the root, they can only enter this organ in a state of solution. In the rain water which percolates the soil we have another source of plant-food. It will be remembered, too, that the acid fluid of the root hairs dissolves from the particles of soil adherent to them mineral substances which are insoluble in water. So important in the processes of plant nutrition is the soil, that its composition and functions and the horticultural operations connected with it demand a detailed consideration.

Let us first distinguish between the surface soil and the subsoil. On examining any plot of garden ground, we shall have before us a top layer of soil four or five inches deep, which is known as the surface soil. Below this we shall find a layer of soil composed of less fine particles, and, as a rule, less fertile than the surface soil. This is called the subsoil, and on its nature we shall see, presently, depends the drainage of the surface soil. Beneath our bed of soil, at a greater or less distance from the surface, according to the depth of the subsoil, will be found either a bed of clay, gravel, or sand, or some kind of rock, such as chalk or limestone.

We have now to consider how soils suitable for the production of vegetable life are formed. Through the medium of natural agencies, what are called local soils are formed just where they are found, in a very interesting manner, viz. by the crumbling and breaking down of the surface of rocks. Frost is one of the means of bringing about this result. When the water which fills the pores of rock freezes, the sudden expansion thus produced acts with great violence on the particles of rock, pushing them asunder and causing the rock to chip and crack in all directions. The difference of temperature between night and day also assists in this process. All rocks swell slightly under the influence of heat, and contract when they are chilled. This alternate swelling and contraction helps to disintegrate the rock through the formation of cracks in its surface. Other important agencies conducing to this end are the action of air and water — bringing the rock into constant contact with a diluted solution of carbon dioxide in water, and thus causing chemical changes among its constituents—the beating of wind and rain against its surface, the penetration of roots —whose acid fluid has power to dissolve many of the strongest rocks—and the decay of dead plants and animal matter deposited on the surface.

Alluvial soils are of quite a different character from local soils, being formed through the action of running water. Particles of sand or clay once detached from the parent rock are quickly carried away by the action of running water, the runnels gradually gaining strength and converging into mountain torrents, which wear away the surface of

the rocks over which they pass. When these mountain torrents converge into rivers the mineral *débris* of the mountains is distributed over the plains. On either side of a river will be seen a strip of perfectly flat meadows or fields which have been formed in this way, for a river gradually alters its channel when any spot gets filled with the mud and silt it brings down from the higher portions of its course. These alluvial deposits are generally deeper than local soils, and very fertile. Alluvial tracts similar to those found on the margins of rivers are formed by the filling up of lakes, where a river brings down a large quantity of mud. It is a matter of common observation that a river that is thick and muddy on entering a lake is much clearer and more limpid on leaving it. The reason of this change is that where the force of the current is slowest the particles of mud fall most readily to the bottom. The current in a lake is extremely slow, and a large deposit of mud is consequently left on its bed, repeated deposits of this kind having the effect of gradually filling it up.

Drift soils occur when the surface rocks of a district become covered with a deposit foreign to them. Of this nature are the deposits in valleys formed through the agency of glaciers. As the glaciers descend slowly into the valleys, their enormous weight grinds away the surface of the rocks over which they pass, and the fragments thus carried down are deposited in the valleys on the melting away of the glaciers. A large area of soil in our country is of this character. Poor drift soils are formed in the neighbourhood of the seashore by the wind blowing the sand inland. In very windy spots they will not hold together sufficiently to secure a firm hold of the roots of plants.

In whatever manner soil under cultivation may have been formed, it will be found to consist of a mechanical mixture of clay, sand, carbonate of lime, and vegetable matter. We will first consider the mineral or inorganic constituents of the soil. One of the most important of these is clay, though, as we shall presently see, it does not contain any important mineral constituent of plant food. It is on account of its physical properties that a proper proportion of clay is necessary to form a good soil. What, then, are these useful qualities? In the first place, the particles of clay are adhesive, *i.e.*, they stick closely together. This, it is true, may be a disadvantage under certain conditions. Pure clay cannot be properly cultivated. When wet it is too sticky, and the action of the sun's rays transforms it into hard tough masses. A moderate degree of adhesiveness, on the other hand, is of the greatest service to soils. The roots thus gain a firm support, while the capillary power of the soil by which water is forced up from below is increased. Another property of clay which cuts both ways is its impermeability. Soils wholly composed of clay would not allow of the free escape of water, and stagnant water is highly injurious to plants, causing them to rot away. When, however, we have a proper proportion of clay in the soil, its power of retaining water becomes of importance, preventing, as it does, the too rapid drying of the soil by the sun, and assisting the garden crop in withstanding drought. The absorbent properties of clay are also of use in preventing certain kinds of plant food from being washed out of the soil by the rain.

Sand in many respects is the opposite of clay. Its particles do not adhere closely together, and a sandy soil is therefore easily worked. In size they are much larger than those of clay, and water easily passes between them, the soil being termed open and porous. Sandy soils are dry and warm, sand readily absorbing heat from the sun and retaining it for a long time. On the other hand, we have seen that soils consisting wholly of sand cannot support plant life. In consequence of its want of power of retaining water, crops on sandy soil are soon scorched up in dry seasons, and in consequence of the want of cohesion of sand particles, the roots of some plants fail in such a soil to get sufficiently firmly established. Moreover, sand is destitute of the power we have seen clay possesses of absorbing and retaining some kinds of plant food, and preventing their being washed into the subsoil by rain.

The carbonate of lime found in soils consists of fragments of chalk or other kinds of limestone, and occurs in much smaller quantities than the two other inorganic constituents we have been discussing. Its physical qualities differ, particles of soft chalk-

like clay conferring a certain amount of stiffness and closeness upon the soil in which they occur, while particles of hard limestone rock have just the opposite effect, rendering the soil light and porous. It is owing to its chemical nature that carbonate of lime plays such an important part in the constitution of the soil. If vinegar be poured on a small quantity of soil containing carbonate of lime, it will be found to froth or effervesce, the weak acid having attacked and dissolved the lime and set free the carbon dioxide which was combined with it, and to whose liberation the froth and fizzing sound are due. The office of carbonate of lime in the soil is to keep the soil in a basic condition—*i.e.*, in a condition which will prevent the accumulation of free acids within it. This prevention is of the greatest importance to plant life, for nitrate of lime, which we shall presently see is the most valuable plant food existing in the soil, is produced by the neutralisation of the nitric acid contained in the soil by the carbonate of lime present there; and unless this acid can be neutralised as fast as it is produced, the production of nitric acid is immediately arrested.

Passing now to the consideration of the organic matter of soils which is known as *humus*, we may notice first that it is the last ingredient acquired by the soil. Such low forms of vegetable life as lichens may be seen growing on the bare surfaces of rocks, the small amount of nourishment they require being supplied by the gases and dust of the air and the traces of mineral matter they are able to extract from the rock. Their decay adds a small amount of vegetable matter to the soil, fitting it for the production of higher forms of vegetable life; these in their turn decay, and thus a soil rich in humus is gradually built up. Soils formed by draining peat bogs consist almost entirely of vegetable matter. Their mode of formation is interesting. Beds of lakes filled up in the manner already described are deficient in natural drainage, and yield crops of mosses, sedges, and rushes, which become submerged below the water-level by the sinking of the land. The crop thus gradually rots away, and another succeeds it on the surface. This in its turn sinks below the surface, and thus beds of partly decayed and compressed vegetable matter are formed which are often many feet deep. They are not suited for the support of crops in general, being too light, spongy, fibrous, and loose. Proper drainage and the addition of heavy mineral matter are required by them. Garden soils contain a large proportion of vegetable matter. The leaf mould which is produced by the slow decay of heaps of leaves forms a brown friable humus which is of the highest value to the compost with which it is mixed.

We must now inquire what the properties are that make humus or vegetable matter of such importance in horticulture. In the first place, every constituent of plant food is contained in humus except nitrate of lime, which is capable of being slowly manufactured from the stock of nitrogen always present in vegetable matter. Next, humus gives both freedom to stiff clay soils, enabling the roots of plants to penetrate such soil in search of food, and firmness to light sandy soils which we have found to be required by roots. Again, the power humus possesses of absorbing moisture from the air and of retaining water is of great benefit in counteracting the effects of drought, especially in the case of dry sandy soils. Its absorbent powers are also of great use in preventing ammonia and other food substances of much value to the plant from being washed out of the soil by the rain to a depth at which they would be of no use to the plant. In the process of decomposition humus maintains the air existing between the particles of soil rich in carbon dioxide, and impregnates the rain which penetrates the soil with the same gas. Now, the action of carbon dioxide in the soil is of the greatest importance, helping to transform, as it does, the dormant matter of the soil into active matter. These terms require a brief explanation. By *dormant* matter we mean, in this connection, the insoluble constituents of the soil; by *active* matter the soluble constituents which can be taken up by the root hairs. The transformation of the former into the latter is constantly though slowly going on under the influences of the weather, oxygen, and carbon dioxide. The decomposition of humus from the carbon dioxide it sets free is of great benefit to soils, increasing their fertility by bringing within the plants' reach a greater supply of active or soluble food.

In practice it will be found that soils under cultivation are a mechanical mixture of the four substances we have been discussing, viz. clay, sand, carbonate of lime, and vegetable matter. Stiff clay soils are of no use for horticultural purposes. Where they occur they are generally laid down in grass. Clay loams in which the proportion of clay compared with sand is large will grow crops that like stiff soil, *e.g.* beans. Loams in which neither sand nor clay is unduly prominent form the best soils for horticultural purposes, yielding, as they do, excellent market garden crops. In sandy loams the sand predominates over the clay, constituting a light, open, dry soil, especially fitted for bulb culture, and such vegetables as turnips, carrots, and potatoes. Light, sandy soils suffer much from drought, and require artificial aids to make them of use to the horticulturist. Marls do not occur very frequently. They are composed of a mixture of clay, loam, and carbonate of lime, and are generally very fertile. Hops do well on such soils. Vegetable mould is found at the feet of forest trees, forming a very rich fertile soil which is of great value as a compost. Peaty soils are formed when the humus exceeds in weight all the other ingredients of the soil. They are very spongy, light, loose, and retentive of moisture—becoming sour, indeed, unless well drained. In horticulture they are required for the growth of special plants, such as heaths, azaleas, and other greenhouse shrubs.

We have now to examine the uses of the soil to the plant; in other words, to consider what are the functions of the soil in horticulture. In the first place the soil has to afford support to the plants grown in it. It must therefore be a firm, porous layer of sufficient depth to enable the roots to penetrate and extend their branches and rootlets in every direction, the root, as we have seen, burrowing in the earth, its anterior parts being pushed forcibly between the particles of soil under the influence of gravity, while the posterior are drawn after it by the shortening of the older portions of the root. The plant is thus maintained in an upright position and kept firm, in spite of the beating of wind and rain.

The soil must allow of the free percolation of both

water and air—substances which we have found to be necessary both to the growth of the plant and the due preparation of the plant food in the soil. We have seen that stagnant water is in the highest degree injurious to the plant, for when the air present in the interstices between the particles of soil becomes prevented from entering the plant by the interstices becoming completely filled with water, the respiration of the root is checked and it rots away. Since plant food can be only absorbed from the soil in the form of a solution, the soil must on the other hand be capable of retaining a certain amount of water, and its pores must be sufficiently fine to allow of the ascent of water from the subsoil by the force of capillary attraction. An instance of the operation of this force may readily be seen if a very small tube be placed u[illegible] right in a glass of water, the water being then found to rise to a higher level in the tube than in the glass. The same process occurs in the soil, and the smaller the passages, *i.e.* the finer the particles of soil, the greater the height to which the water will be forced up from the subsoil, thus securing the plant against drought.

Since seeds and roots are sensitive to the influences of temperature, the soil must be capable of storing up some of the neat received from the sun during the day, thus rendering the temperature more equable, and it must also serve as a protection from frost in winter. It is, moreover, as we have seen, the source of the mineral matters which are required in the plant's nutrition, and it is the seat of the important chemical changes which prepare plant food little by little for reception into the plant. Sand, clay, and humus, the main ingredients of the soil, are not in themselves plant foods, it must be remembered. The real plant foods formed from them are nitrate of lime, and compounds of lime, potash, phosphorus, sulphur, magnesium, and chlorine. To these should be added a little silica, and a trace of oxide of iron. We may say, briefly, that the soil must contain nitrogen, phosphoric acid, and potash. Nitrogen is used by plants in the form of nitrate of lime, and *nitrification*, the production and accumulation of nitrate of lime in the soil, is one of the most important changes that render a soil adapted for the growth of crops. Let us examine this process further.

Nitrate of lime is formed of three elements: lime, or rather calcium, which is derived from the carbonate of lime all soils contain; nitrogen, which is yielded up by the decaying animal or vegetable matter found in soils; and oxygen, supplied by the air. During the process of decomposition of the animal and vegetable matter contained in the soil, ammonia gas, a compound of nitrogen and hydrogen, is formed and retained by the soil. Under the influences of air, warmth, and rain, the ammonia thus formed gives rise by the action of certain bacteria to nitrate of lime. The free admission of air will readily be seen to be necessary in this process, since free oxygen gas is wanted to enter into combination with the lime and nitrogen, and is also necessary to consume the hydrogen of ammonia by uniting with it to form water. It is for this reason that the horticultural operations of digging, stirring, and hoeing are resorted to, exposing as they do fresh surfaces of soil to the air. Warmth, too, is essential to nitrification, the formation of nitrate of lime proceeding most rapidly in hot weather and ceasing almost wholly in extreme cold. Rain in moderate quantities is favourable to nitrification, very little nitrate of lime being formed in dry weather. Excessive rains are, however, prejudicial in this connection, for nitrate of lime is readily soluble in water, and therefore is liable to be washed out of the soil.

The proportion of potash compounds and phosphates occurring in the soil in a soluble condition is not large, and as these substances in a soluble form are necessary to plant nutrition, resort to potash and phosphatic manures is often requisite to secure a good crop. We shall see presently that manuring is one of the most important methods of improving poor soils.

Passing now to the horticultural operations connected with the soil, we will first consider the important question of drainage. We have seen in our discussion of the functions of the root that it is only water in a hygroscopic condition—that is, in the form of thin films surrounding the moist particles of soil—that is of service to the plants' roots. Stagnant water, it cannot be too often repeated, is most injurious to plants. It chills the ground and keeps out the air which we have found helps to oxidise the organic matter of the soil. Moreover, stagnant water has lost other valuable materials of service in plant nutrition, viz., carbon dioxide and the traces of nitric acid and ammonia salts found in rain. Drainage secures several advantages to the land. In the first place a free passage is secured for the rain, its valuable properties being given up to the soil and the roots of growing plants. Air follows as the rain sinks through the soil and effects the decomposition of organic matter, the use of which has already been shown. Another good effect of drainage is that the soil is thereby pulverised, becoming fine and powdery. This is effected through the alternate swelling and contraction produced by the wetting and drying of the soil. The soil also becomes warmer. Several practical benefits are found to follow drainage. The cultivator secures an earlier and more abundant crop, which is also of a higher quality. He can grow a greater variety of crops, and cultivation is rendered easier and less expensive, it being waste of time to try to work wet land. Moreover, the artificial help of manure to which he may have to resort is far more effectual in the case of well-drained than in the case of wet land.

Another important horticultural operation is the deepening of the soil by the processes of digging and trenching. By trenching we mean moving the whole of the soil to the depth of two feet or more. The first time of trenching, the best and most workable soil should be kept at the top. When it is trenched again, a considerable portion of the under spit may be mixed with the upper soil, and when land is trenched for the third time the whole may be blended together. Autumn or the beginning of winter is the best time for trenching, the action of frost sweetening and pulverising the subsoil brought to the surface. Rough digging is resorted to in the autumn for the same reason, and the surface of soil should be kept open throughout the growth of the plant in spring and summer by means of the hoe. The more complete the division of the soil, the more easily will roots penetrate the land, and the deeper the soil the greater is the area of feeding space afforded them.

We come now to the important question of the improving of soils by the process of manuring. By manure we mean a substance essential to the growth of a crop, but which is not contained in the soil in sufficient quantity, or in a suitable form for immediate consumption. It may be briefly called artificial plant food. It is a matter of common observation that successive crops, when no such artificial food is applied to the soil, exhaust the land on which they are grown, and get poorer and poorer in quality. They have diminished the stock of fertility in the soil by using up the nitrate of lime and the mineral ingredients—phosphates and potash compounds—which we have found to be of such supreme importance to the plant. To restore fertility to the soil it is best to apply to it in the form of manure phosphates and potash combined with nitrogenous matter. Manures may be divided into two classes—general manures which restore to the soil the entire loss it has undergone, and special manures which only contain one or two valuable constituents of plant food, but are of service when a soil is deficient in some particular element of fertility, such as phosphates, or for special crops.

The general manures used by the horticulturist are the all-important farmyard manure, or dung, blood, and guano. Blood is often applied as a manure to the roots of fruit trees. Guano is similar in its nature to farmyard manure, consisting as it does of the dried excreta of sea birds accumulated through long ages. Farmyard manure is of the utmost service to the horticulturist. Its dung and straw enrich the soil with organic or vegetable matter, which decays gradually in the soil, producing carbon dioxide and water. In all soils, whether heavy or light, the carbon dioxide thus formed is soluble in the water that percolates the soil, and dissolves out phosphates and potash from the particles of clay and rock which compose the soil. Farmyard manure also improves the texture of the soil. The gas continually engendered between the particles of heavy soil renders it more open and free, while the particles of humus which accumulate in the soil, being the lightest and loosest of soil ingredients, also assist in this direction. In sandy soils, on the other hand, soils which we have seen are especially subject to drought, the particles of humus supplied by well rotten manure are of service in retaining the moisture so much needed by the soil. Farmyard manure may either be applied to the land as a top dressing, or may be dug into the soil. When applied in hot weather the latter course should be pursued, as the drying action of the sun deprives it of much of its efficacy. Farmyard manure is put to the land at almost every season of the year—to young seeds in January and February, to potatoes in March, to turnips in the early summer, to garden ground generally in the autumn and early winter, fitting it for the next season's crop. The heat of fermenting dung is made use of in horticulture in the formation of hot beds, the gardener's friend in the work of propagation and seed-raising. The richer the matter is in nitrogen, the more speedy will be the decay and the greater the heat produced. Thus it is found that the greatest heat is produced by manure composed of sheep dung, the next greatest by horse dung, next cattle dung, while a hot bed of spent tan and leaves or grass engenders still less heat. On the other hand, the greater the heat the sooner it is over. The bulk of all farmyard manure is cattle manure. It is less hot than stable manure. Rotten manure is used in the spring, because it is wanted to act at once on the crops. When manure is applied in the autumn it is allowed to decay on the land, either on the surface or after being forked in. Peruvian guano, the other important general manure we have to consider, is a brown powder which contains large quantities of phosphates, and is therefore a valuable adjunct to farmyard manure, a substance poor in phosphates. It is a very quick acting manure, and on account of the high degree of solubility of its phosphates and nitrogen compounds is best applied in the spring. It should be remembered that if Peruvian guano comes in contact with seeds it will injure them. Seaweed is a general manure of special value for potatoes and asparagus, on account of the potash salts it contains; but its supply is necessarily limited.

Coming now to the question of special manures, bones, ground or dissolved with sulphuric acid, are an important artificial food for crops requiring phosphates. Nitrate of soda is a compound of nitrogen ready for immediate use by the plant, but must be carefully applied, too strong an application killing the plants to which it is applied. It is rapidly washed out of the soil, and as it does not contain phosphates and potash, the soil on which it is used must be plentifully supplied with these substances either naturally or artificially. Soot is an excellent top dressing to crops, keeping away as it does slugs and other vermin with which the horticulturist has to contend. Mineral superphosphate of lime is the staple phosphatic manure. It is in appearance a grey powder, fine, dry, and friable. It is a quick-acting manure, and is best applied in the spring. It is an invaluable manure for turnips. Chloride of potash has been found to be a valuable manure for beans.

In applying manures we have, then, two chief points to consider—the suitability of the manure to the crops it is designed to improve, and the quantity it is desirable to apply. Leafy cruciferous plants, such as cabbage and broccoli, onions, rhubarb, celery, are all greatly benefited by nitrogenous manures, but require in addition phosphates and potash. Leguminous crops, such as peas and beans, do not as a rule need nitrogenous manures, but are benefited by mixed minerals. Potatoes, vines, and fruit crops derive much advantage from potash manures to which in many cases nitrates and phosphates should be added. It must be remembered that over-manuring is prejudicial in its effects. The roots become oversized, loose, and spongy, and are found to be watery and flavourless. The plant itself runs to leaf, the important part for which it is grown, its tuber, fruit, or flower, not developing till too late. Manure, it should be noticed, may be applied in a liquid as well as in a solid form. Liquid manure is used for pot plants, and much less frequently for certain growing crops, *e.g.* roses. It is quick in its action.

The horticultural operation of potting must be briefly referred to in our discussion of the soil. A due supply of plant food in a form ready for the plant's use, a sufficient supply of root room, and thorough drainage, are the chief requisites for success in this direction. Plants are firmly potted, the roots when in a reasonably compact mass of earth being

less liable to suffer from drought than when loosely potted. It is found in practice better to feed the plant artificially with liquid manure than to give it too much root room, larger flowers and of better quality being produced more abundantly in the former case.

To recapitulate: We have seen that—

1. The substances contained in a full-grown plant are water, organic matter, and fixed or inorganic matter known as ash.

2. The necessary mineral ingredients of plants are potash, lime, magnesia, phosphoric acid, sulphur trioxide, and a minute quantity of iron.

3. In the soil, atmosphere, and water, we have three important sources of plant food.

4. Local soils are formed where they are found by the crumbling and breaking down of the surface of rocks under the influence of weather. Alluvial soils have at some time been formed by the agency of running water. Drift soils owe their origin to the action of glaciers or the wind.

5. Soil is a mechanical mixture of clay, sand, carbonate of lime, and vegetable matter. The chief properties of clay are adhesiveness and impermeability. Sand conduces to good drainage and makes a soil dry and warm. Carbonate of lime is of importance to the soil from its chemical action in the process of nitrification. Humus or vegetable matter improves the mechanical texture of heavy soils, and increases the fertility of the soil by helping to bring within the plant's reach a greater supply of active or soluble food.

6. The soil must afford support to the plants grown in it. It must allow of the free percolation of water and air. It must be capable of storing up heat and serving as a protection against winter frosts. It is the seat of important chemical changes which prepare plant-food little by little for the plant's use.

7. Drainage is of the greatest importance to the soil, securing many practical benefits to the cultivator.

8. Deep cultivation, by means of trenching and digging, secures to the plant a greater area of feeding space and enables its roots to penetrate the soil more easily.

9. In the case of impoverished soil, artificial food must be supplied in the form of manures. Manures may either restore to the soil all the elements of fertility, as in the case of guano and farmyard manure, or only some, as in the case of chloride of soda. In applying manure, the nature of the crop must be considered, and manure must not be used in excessive quantities. Liquid manure is of great benefit to pot plants.

10. In the horticultural process of potting, care must be taken to secure a moderate amount of root room, thorough drainage, and a due supply of immediately available plant food.

OUR PUPIL TEACHERS' COURSE.

TEST EXAMINATION QUESTIONS.

First Year.—Boys and Girls.

(*Answer Questions* 1 *and* 6 *and any two other questions.*)

1. Analyse the appended passage and parse the italicised words:—'*Upon* the name of Nigel Olifaunt, *Lord Glenvarloch*, *being* again *hollowed* into his ear, he *drew up*, and *regarding* his entertainer with *some* austerity rebuked *him* for not *making* persons of quality *acquainted* with each *other*.'

2. Write down a list of words which have two plurals of different meanings.

3. Employ the words *as*, *but*, *that*, *what* in as many different ways as you can, and in each instance parse them.

4. Form Nouns from smite, dig, tell, steal, brass, create, smooth.
Form Adjective from kin, anger, right, wretch, talk, quarrel.
,, Verbs ,, grass, chat, scribe, white, gold.

5. Draw up a Table of Conjunctions.

6. Reproduce in your own words the story read by the Examiner.

Second Year.—Boys and Girls.

(*Answer Questions* 1 *and* 6 *and any two other questions.*)

1. Analayse the subjoined lines and parse the words in italics:—

'*For though from out* the bounds of Time and Place
The tide *may bear* me *far;*
I hope *to meet my* pilot *face* to face,
When I have crossed the *bar*.'

2. Paraphrase the above passage.

3. Say how you would explain the term '*government*' to Standard IV. Give illustrative sentences.

4. Write out the principal facts concerning Interjections.

5. Select the prefixes and affixes from the following words, and give their meanings:—*submission*, *subterranean*, *antedate*, *counterfeit*, *affiance*, *lucifer*.

6. Write a short essay upon 'England's Mineral Wealth,' or 'The Evils of Slavery.'

Third Year.—Boys and Girls.

(*Answer Questions* 1 *and* 2 *and any other two questions.*)

1. Paraphrase the following extract:—

'The *applause* of listening senates to command,
The threats of pain and ruin *to despise*,
To scatter plenty o'er a smiling land,
And *read their* history in a nation's eyes
Their lot forbade; nor *circumscribed alone*
Their glowing virtues, but their *crimes* confined
Forbade *to wade* through slaughter to a throne
Or shut the *gates* of mercy on *mankind*.'

2. Analyse the foregoing stanzas and parse the indicated words.

3. How may the Subject or Object of a sentence be enlarged?

4. Select from the subjoined excerpt all the words of Latin origin, and give their derivation:—'Nigel in an instant comprehended, as well as from Sir Mungo's manner, as from a strict compression of their entertainer's lips, which intimated the suppression of a desire to laugh, that he was dealing with an original of no ordinary description, and accordingly, returned his courtesy with suitable punctiliousness.'

5. Distinguish, giving illustrative sentences, between the following pairs of words:—
Reverend, Depositary, Complacent, Obverse, Ark, Salve, Salvage.
Reverent, Depository, Complaisant, Reverse, Arc, Salver, Savage.

PENMANSHIP.

All Years.

Large Hand: Troglodytically.
Small Hand: 'Lucy at her wheel shall sing
In russet gown and apron blue.'

ARITHMETIC.

First Year.—Boys only.

(*Answer three questions only, including Question* 1.)

1. (*a*) Prove that the value of a fraction is not altered by multiplying its numerator and denominator by the same quantity.

(*b*) An English mile is ·2136 of a German mile. What time will a man who walks 4 English miles an hour take to walk a German mile? Ans. 1 hr. $10\frac{20}{89}$ mins.

2. How many tons of gold at £3·89375 per oz. are contained in a lump worth £113·6975? Ans. ·0008147...tons.

3. Simplify $\frac{1\cdot5\dot{7}}{3\cdot2\dot{6}} \times \frac{4\cdot08\dot{3}}{1\cdot26\dot{2}} \times \cdot64$. Ans. 1.

4. What is the difference between $1\frac{11}{12} + 2\frac{13}{11} + \frac{17}{33}$ and the nearest integer? Ans. $\frac{17}{132}$.

GIRLS ONLY.

1. (*a*) Explain the method of finding the L. C. M. of three numbers. Take 15, 21, 35.

(*b*) Sum 4 of Boys'.

2. A man saves 6½d. a week by half starving himself. At the end of 252 weeks he falls ill in consequence, and has to pay a doctor's bill of seven guineas. How much has he saved or lost on the whole?
Ans. Lost half-a-guinea.

3. Make out and duly receipt a bill for :—

	£	s.	d.
18 galls. at £2 per quarter - - -	0	11	3
6 qrs. 2 bhls. at 1s. 6d. per gall. - -	30	0	0
15 qts. 1 pt. at 4s. per gall. - - -	0	15	6
15 pecks 1 qt. at 4s. per bhl. - - -	0	15	6
12 doz. at £2 7s. 6d. per score - -	0	6	7½
Ans. Total	32	8	10½

4. Find the valve of 270 times the difference between $\frac{1}{10}$ × cwt. and $\frac{1}{14}$ × 2 cwt. 1 qr. 4 lbs. Ans. 3 qrs. 20 lbs.

SECOND YEAR.—BOYS ONLY.

(*Work three Questions only, including the last.*)

1. A ditch is being dug at the rate of 81 ft. per day by 54 men. After 13 days' work, 8 of them are replaced by boys, and the work goes on for 11 days more, at the end of which the whole length dug is 1889 ft. How much work per day do the boys execute?
Ans. 7 ft.

2. In running a 3-mile race on a course $\frac{1}{3}$ of a mile round, A overlaps B at the middle of the 7th round. By what distance will A win? Ans. $\frac{6}{13}$ of a mile.

3. At what rate will the interest on £326 for 15 years amount to £220 1s. 0d.? Ans. 4½ per cent.

4. (*a*) Explain the terms Discount, Brokerage, Consols, Present Worth.

(*b*) If 201 men and 335 boys do in 210 days the same amount of work that 70 men and 96 boys do in 665 days, compare the average daily work done by each man with that done by each boy.
Ans. As 3 : 2.

GIRLS ONLY.

1. Divide 964374 by 165 by short division and explain the process. Ans. 5844, rem. 144.

2. Find *by practice* the weight of £54 2s. 9d. worth of currants at £1 for 1 ton 2 cwt. 3 qrs. Ans. 61 tons 11 cwt. $2\frac{44}{80}$ qrs.

3. Reduce to a decimal $2\frac{1}{3}$ $[72\frac{2}{5} - 1\frac{1}{4}\{8\frac{1}{10} - 2\frac{1}{8}(\frac{2}{5} - \frac{1}{10})\}]$.
Ans. −1·75.

4. (*a*) Illustrate by a diagram that $\frac{3}{5} \times 1\frac{2}{3} = \frac{5}{4}$.

(*b*) Reduce $\frac{2}{5}$ to fractions, having first a numerator 2, and second a denominator 10.
Ans. $\frac{2}{5\frac{1}{2}}$, $\frac{3\frac{3}{4}}{10}$.

THIRD YEAR.—BOYS ONLY.

(*Work three questions only, including the last.*)

1. What number squared will equal the difference between $(61)^2 - (11)^2$? Ans. 60.

2. Find the discount on £388 17s. 9d. due 18 months hence at 4 per cent. Ans. £22 0s. 3d.

3. By selling out £4,500 in the India 5 per cents. at 112½, and investing the proceeds in Egyptian 7 per cents., I gain £168 15s. in income. What is the price of the latter stock? Ans. £90.

4. (*a*) Prove that the Interest minus the Discount : Discount : : Interest : Principal.

(*b*) The difference between the interest and discount of a certain sum for ten years at 5 per cent. is £16 13s. 4d. What is this sum? Ans. £100.

GIRLS ONLY.

1. Sum 3 of First Year Boys'.

2. A grocer mixes 12 lbs. of tea at 2s. 6½d. per lb. with 4 lbs. at 3s. 2½d. At what price must he sell the mixture so as to gain ⅓ of his outlay? Ans. 3s. 7½d. per lb.

3. A, B and C run a 600 yards race, and B loses by 40 yards, and C by 68 yards. By how many yards can B beat C in a mile race?
Ans. 88 yards.

4. (*a*) Prove that in a proportion of 4 terms, 'The product of the extremes equals the product of the means.'

(*b*) Supply the missing terms of :—

(i.) As 15 : 18 :: 25 : ( ). Ans. 30.

(ii.) As £12 : 6s. 8d. :: ( ) : 5 ozs. Ans. 11¼ lbs.

(iii.) As $\frac{3}{8}$: ( ) :: $\frac{5}{6}$: $\frac{9}{4}$. Ans. $\frac{27}{20}$.

(iv.) As ( ) : *a* :: 4 : 2. Ans. 2*a*.

TEACHING.

SECOND YEAR.—BOYS AND GIRLS.

(*Answer two questions only.*)

1. Write out half-a-dozen simple rules which will aid in securing correct spelling.

2. Give the alternative forms of the manuscript letters (capitals and smalls), stating which you prefer, and why.

3. What are the advantages of the 'Metric System'? Give illustrative examples.

THIRD YEAR.

1. In teaching English Grammar, what use would you make of, and at what stages would you introduce, Analysis of Sentences?

2. Draw up a detailed Syllabus of 30 Lessons to Stand. I., on common objects suitable for a Class Subject.

3. Compile a Blackboard Sketch of a Lesson on—
(*a*) The Queens Regnant of England. (Stand. VII.) *or*
(*b*) Beaks and Claws of Birds. (Infants.)

ALGEBRA.

THIRD YEAR.—BOYS ONLY.

(*Answer three questions, including Question* 4.)

1. (*a*) Simplify the expression—

$$\frac{\frac{a}{b} \div c + \frac{b}{c} \div a + \frac{c}{a} \div b}{\frac{b}{a} \div c + \frac{c}{b} \div a + \frac{a}{c} \div b}.$$ Ans. 1.

(*b*) And shew that it is equal to—

$\frac{s(s-a) + (s-b)(s-c)}{bc}$ when $2s = a + b + c$.

2. (*a*) Find the square of $1 - \frac{a}{2} - \frac{a^2}{8}$. Ans. $1 - a + \frac{a^3}{8} + \frac{a^4}{64}$.

(*b*) Find the square root of—

$\frac{x^4}{64} - \frac{x^3}{8} + x + 1$. Ans. $1 + \frac{x}{2} - \frac{x^2}{8}$.

3. A number consists of three digits, the right-hand one being zero. If the left-hand and middle figures be interchanged, the number is diminished by 180. If the left-hand digit be halved, and the middle and right-hand digits be interchanged, the number is diminished by 454. Find the number. Ans. 860.

4. (*a*) Prove the rule for finding the G. C. M.

(*b*) Find L. C. M. of $14x^2 - 5(a-b)x - (a-b)^2$, and $21x^2 - (11a - 3b)x - 2a^2 + 2ab$.
Ans. $(7x + a - b)(2x - a + b)(3x - 2a)$.

MENSURATION.

THIRD YEAR.—BOYS ONLY.

(*Answer one question only.*)

1. Find in acres the area of a parallelogram, one of whose sides is 30 chains, and another 15 poles, and one of whose angles is 30°.
Ans. 5·625 acres.

2. Find in acres the area of a triangle whose sides are 34 chains, 18 chains, and 20 chains respectively. Ans. 14·4 acres.

EUCLID.

(*Answer two questions, including Question* 3.)

SECOND YEAR.—BOYS.

1. Write out Euclid I., 5.

2. Write out Euclid I., 26.

3. If two triangles have two sides of the one equal to two sides of the other each to each, one angle of the one also equal to one angle of the other—when will the triangles be equal in every respect?

THIRD YEAR.—BOYS.

1. Write out Euclid I., 37.

2. Write out Euclid I., 48.

3. Calculate from corollary to Euclid I., 32, the magnitude of the angles of a pentagon and decagon. Show also from same corollary that two straight lines cannot enclose a space.

GEOGRAPHY.

BOYS AND GIRLS.

(*Answer three questions only, including Question* 5.)

FIRST YEAR.

1. Describe the Pennine Range, mentioning the rivers rising therein.

2. Enumerate the Provinces of Australia, stating the area, productions, and chief towns of each.

3. What do you know of the Lake Systems of British N. America?

4. Give instances of rivers rising in glaciers, lakes, and marshes; also of rivers flowing into lakes, lost in deserts, and those forming deltas.

5. Draw a map of Central England *or* Ulster.

SECOND YEAR.

1. Name the six greatest European Powers, mentioning approximately their area, population, revenue, and standing army and navy.

2. (*a*) What races inhabit India? (*b*) What religions are professed in Hindostan? (*c*) What are the border and independent interior states?

3. (*a*) Explain the utility of Latitude and Longitude. (*b*) Why do ships carry chronometers set to Greenwich time? (*c*) What is longitude of a place where it is half-past five p.m. when it is noon at Greenwich?

4. Where and what are Ajaccio, Kremlin, Hague, Stamboul, Ghats, Basques, Sikhs, Seringapatam, Coromandel?

5. Draw a Map of the Seine *or* the Tagus.

THIRD YEAR.

1. What portions of Africa are possessed by European Powers?

2. Give particulars respecting Japan under the headings of situation, extent, people, productions, climate.

3. Account for (*a*) Land and Sea Breezes, and (*b*) The Labrador Current.

4. What do you know of 'The Grand Llama,' The Tycoon, The Pigmies, The Parsees, The Mandarins, The Mahdi.

5. Draw a Map of The Levant *or* of Cape Colony.

HISTORY.

BOYS AND GIRLS.

(*Answer three questions only.*)

FIRST YEAR.

1. Enumerate, giving particulars, the principal Roman Governors of Britain.

2. State what you know of the Bretwaldas.

3. Write short lives of *two* of the following :—Bede, Harold II., Agricola, Dunstan.

4. Account for the comparative ease with which the Norman Conquest was effected.

5. For what events were the following years memorable :—62, 597, 664, 835, 878 and 1,016.

SECOND YEAR.

1. What do you know of any four of the following :—Stephen's Charter, Scutage, Longbeard, Mise of Amiens, Loudon Hill, Salic Law.

2. What were the Statutes, *and when passed*, directed against (*a*) sub-infeudation, (*b*) alienation of land to religious bodies, (*c*) bringing of suits before foreign courts, (*d*) Lollardism.

3. Give an account of Henry V.'s French campaign.

4. Compare the rival claims of York and Lancaster.

5. Narrate the course of Scottish events in Edward I.'s reign.

THIRD YEAR.

1. Give *dates* of Poyning's Law, Field of Cloth of Gold, The first English Prayer Book, Wyat's Insurrection, Statute of Apprentices, and Hampton Court Conference.

2. Trace the descent of James II. from Henry VII. Enumerate the Queens Consort and Queens Regnant from 1485 to 1688.

3. What were the causes and the chief events of Elizabeth's '*Duel with Spain*'?

4. State what you know of the Royal Favourites during the Tudor period.

5. What do you know of 'The Whip with Six Strings,' and Elizabeth's 'Poor Law Act.'

NEEDLEWORK.

(*Answer one question only.*)

FIRST YEAR.

1. Cut out and tack together a pinafore for a child of five years. Work a button-hole on calico, and sew on a tape as for a string.

2. Cast-on 30 stitches and show how you would narrow as for the angle of a stocking. Plain-darn a hole on stocking-web material.

SECOND YEAR.

1. Place and work a print patch.

2. Draw the flat pattern of a boy's shirt ($\frac{1}{4}$ size) and *place* a triangular flannel patch.

THIRD YEAR.

1. Darn a cross-cut as for a linen table-cloth.

2. Cut out and tack together a pair of child's drawers.

MUSIC.

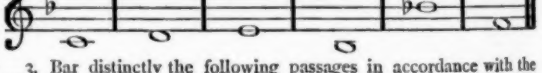
N.B.—The Practical Tests in Music must not be neglected.

(*Pupil-Teachers may answer the questions either in the Staff or Tonic Solfa Notation, but not in both.*)

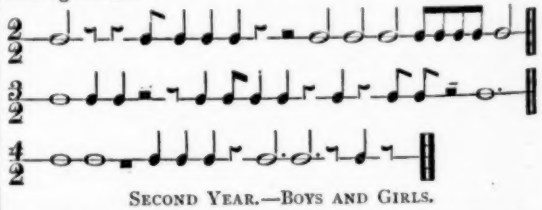
FIRST YEAR.—BOYS AND GIRLS.

1. Account for the sharpening of F and the flattening of B in the keys of G and F major, respectively.

2. Add perfect fifths *above* each of the following notes :—



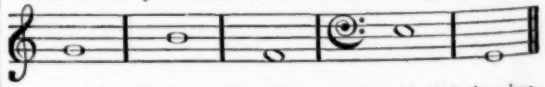
3. Bar distinctly the following passages in accordance with the time signatures :—



SECOND YEAR.—BOYS AND GIRLS.

1. Write in the Bass Clef the signatures of the following major keys :—A, C♯, D♭, B, B♭, A♭.

2. Write a major sixth *above* each of the following notes :—



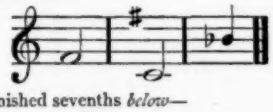
3. Bar the following passages in accordance with their time signatures :—

THIRD YEAR.—BOYS AND GIRLS.

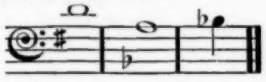
1. Write in the Treble and Bass Clefs the signatures of the following *minor* keys :—C, F, G, B♭, A.

2. Write the following intervals :—

(*a*) Tritones *above*—



(*b*) Diminished sevenths *below*—



3. Explain briefly the meanings of the following musical terms:—

(*a*) Triple Time.
(*b*) Accelerando.
(*c*) Da Capo.
(*d*) Sub-dominant.
(*e*) Andante.
(*f*) Staccato.

Tonic Sol-fa Notation.

FIRST YEAR.—BOYS AND GIRLS.

1. What are the mental effects of each note of the scale, sung slowly and separately ?

2. Name the following intervals :—

d	s	m	f	f
s_1	r	t_1	d	m

3. Write over each note and rest in the following passage, its value in pulses or fractions of a pulse :—

:m.f:s | s.f:m :-.f | s :— :— | :s.m :d | ‖

SECOND YEAR.—BOYS AND GIRLS.

1. Re-write the following passage, making a change to the first sharp key at (*a*), and returning to the original key at (*b*):—

(*a*) (*b*)

d r m fe l s fe s l f r m d

2. Write the following intervals:—

Perfect fourth *above*	ta.	Major third *above*	lah.
Perfect fifth ,,	fe.	Minor ,, ,,	doh.
Major sixth ,,	soh.	Minor sixth ,,	doh.

3. Re-write the following in four-pulse measure, doubling the value of each note and rest :—

| s.-,f :m | f.s,f :m.s | d :r.-,m | f,s.f,m:r. ‖

THIRD YEAR.—BOYS AND GIRLS.

1. Write out three forms of the ascending minor scale.

2. Write the following passage in Key F, preserving the same pitch :—

Key G.

l_1 d ta l m r d m m f

3. As in Staff Notation.

MODEL ANSWERS TO MUSIC.

Examination, 15th April 1893.

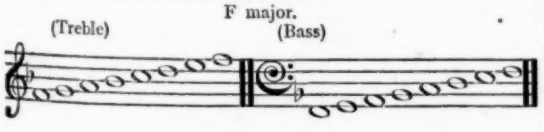
Staff Notation.

PUPIL TEACHERS AT END OF FIRST YEAR.

1. Write the signatures and scales (using semibreves) of F and G major in the Treble and Bass Clefs :—

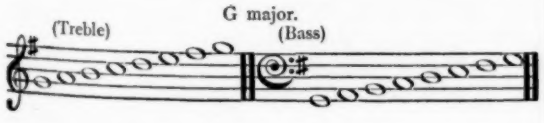
F major.

(Treble) (Bass)



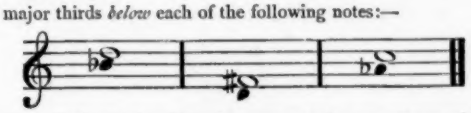
G major.

(Treble) (Bass)

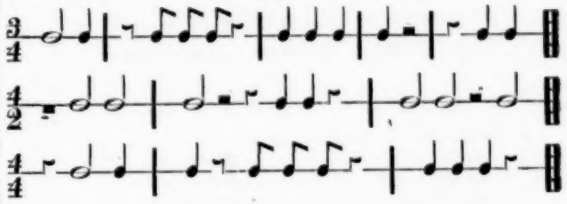


2. Add major sixths *above* each of the following notes:—

and major thirds *below* each of the following notes:—



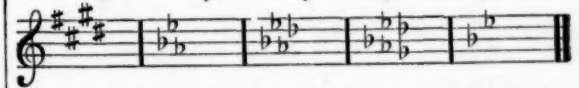
3. Bar distinctly the following passages in accordance with the time-signatures. Each passage commences a bar:—



PUPIL TEACHERS AT END OF SECOND YEAR.

1. Write in the Treble Clef the signatures of the following major keys :—

E E♭ A♭ D♭ B♭



2. Write a diminished or minor fifth above each of the following notes :—

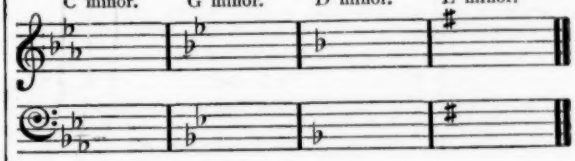
(Treble) (Bass)

3. Bar the following passages in accordance with the time-signatures. Each passage commences a bar :

PUPIL TEACHERS AT END OF THIRD YEAR.

1. Write in the Treble or Bass Clefs the signatures of the following *minor* keys :—

C minor. G minor. D minor. E minor.



2. Write the following intervals :—

(*a*) Augmented fifths *above* each note.

(*b*) Diminished sevenths *below* each note.

3. Explain (briefly) the meaning of the following musical terms:—
(*a*) Duple time.—Rhythm with a strong accent once in every two beats or pulses.
(*b*) Rallentando.—Gradually slower.
(*c*) Legato.—Bound, connected.
(*d*) Ad libitum.—At the will of the performer.
(*e*) Supertonic.—The second tone of a scale.

Tonic Sol-fa Notation.

END OF FIRST YEAR.

1. What other groups of contiguous scale tones are separated by the same interval steps as the following:—

(*a*) (*b*) (*c*)

m f s l || s l t d' || r m f s ||

Ans. (Each group to be an ascending series.)

(*a*) (*b*) (*c*)

t_1 d r m || d r m f || l_1 t_1 d r ||

2. Name the following intervals:—

(*a*) *me* to *doh*^{1}.	Minor sixth.
(*b*) *fah* to *soh*.	Major second.
(*c*) *ray* to *lah*.	Perfect fifth.
(*d*) *doh* to *te* (up).	Major seventh.
(*e*) te_1 to *me*.	Perfect fourth.

3. Write over each note and rest in the following its value in pulses or fractions of a pulse:—

1½ ½ ½ ½ 2 ½ ½

| m :- .f :s . | f :— :m .r |

3 1 ½ ½ 1

| d :— :— | :s .t_1 :d ||

END OF SECOND YEAR.

1. Re-write the following passage, making a change to the first sharp key at (*a*), and return to the original key at (*b*):—

Key C. (*a*) (*b*)

m s d m fe l r s fe s f t_1 d

Ans. m s d ^{m}l$_1$ t_1 r s_1 d t_1 ^{d}s f t_1 d

2. Write the following intervals:—

Perfect fifth	above te_1 = *fe*.
Major third	,, *ray* = *fe*.
Minor third	,, *soh* = *ta*.
Major sixth	,, *doh* = *lah*.
Perfect fourth	,, *fah* = *ta*.

3. Re-write the following in two-pulse measure, halving the value of each note and rest:—

s :- .f	m :
f :s .f	m :s
d :—	r :- .m
f .s :f .m	r :

Ans.

| s ., f:m . |
| f .s,f :m .s |
| d :r .,m |
| f,s .f,m :r . |

END OF THIRD YEAR.

1. Give an example of (*a*) an augmented fifth, (*b*) an augmented second, and (*c*) an augmented fourth, from the following form of the minor scale:—

l_1 t_1 d r m f se l.

(*a*) d to se (*b*) f to se (*c*) r to se

2. State the pitch (as C, D, G, &c.) of the following notes, supposing the key to be F:—

d m t_1 d l s r m

F A E F D^1 C^1 G A.

3. Explain (briefly) the meanings of the following musical terms:—
(*a*) Duple time.—Rhythm with a strong accent once in every two beats or pulses.
(*b*) Rallentando.—Gradually slower.
(*c*) Legato.—Bound, connected.
(*d*) Ad libitum.—At the will of the performer.
(*e*) Supertonic.—The second tone of a scale.

THE 1894 SCHOLARSHIP EXAMINATION.

BY DR. GEORGE BEACH, M.A.,

Co-Author of 'A Manual of our Mother Tongue,' 'A Girl's Arithmetic.' Author of 'Elements of English,' 'Entertaining Readers,' etc.

I. Our first words this month must be those of EXHORTATION. Every third and fourth year Pupil Teacher should be now earnestly engaged in Scholarship Preparation, and if honouring us by following this course, should do so in its entirety. In the preparation of our Routines and the selection of our examination questions, many laborious hours have been spent; and they form one complete whole, from which no part can be omitted without considerable loss.

Even if through illness, or any other mishap, some candidates should lag behind, nevertheless let them continue plodding along without leaving anything out, and in due time they will overtake their arrears if they faint not.

II. For this cause we have arranged the ROUTINES so that they cover only the Lunar and not the Calendar Month. Thus every quarter there will be a week to spare; and in addition, a week's holiday will be allowed at Christmas and Easter.

When in the Routines two subjects appear in the rectangle devoted to an hour's work, the upper subject is for Men and the lower for Women, *or*, as in 'language,' the subjects are alternative.

Three hours' work each day is absolutely necessary, and there are few minds or constitutions that can study a longer time per diem with advantage. In the case of Pupil Teachers the hour's lesson with the Head Teacher can count as one of the three.

Even if 18 hours be allowed for sleep, school-duties, meals and recreation, there still remain six hours, only half of which is asked for study.

If it be found that in every detailed particular, the routine does not suit every individual or each local arrangement, it will be easy so to transpose a subject or two, as to adapt it perfectly to all instances.

III. Let no Candidate omit practising Examination Answering, as more depends upon polished reproduction of knowledge than the mere tyro ever dreams of. Style, arrangement, judicious compression, and selection, are all matters of extreme importance, and their mastery is only obtained by toilsome application under judicious direction. As announced last month, we have made arrangements with high-class Graduates and experienced Teachers, specialists all, to COACH Candidates on the lines of these Articles, Routines, and Questions.

Applications to join our classes should be made at once to Dr. G. Beach, M.A., Stanley Mount, Macclesfield, from whom further particulars may be obtained.

This course has been adopted by special request, and we have no desire whatever to interfere with any Reader who can procure efficient assistance elsewhere, or with the clients of any 'COACH.'

IV. The exact lines of study will be greatly furthered by a careful perusal of our '1893 Scholarship' Articles, which contain ANALYSES OF THE QUESTIONS SET DURING THE LAST TWELVE YEARS, in (*a*) Domestic Economy, (*b*) English, (*c*) Geography, (*d*) History, (*e*) School-Management, (*f*) Euclid, (*g*) Needlework, (*h*) Algebra. We now insert (*i*) MENSURATION.

(i.) *Rectangles, etc.*

(1.) A cottage which stands on a square plot of 729 feet, contains four rooms of equal size on the ground floor, and is divided into two equal parts by a passage 4 feet wide, having two rooms on each side. Allowing 1 foot for the thickness of each wall, find the area of each of the four rooms. (1881.)

Ans. 114 sq. ft.

(2.) The area of a chess-board which contains 64 equal squares and an outer rim an inch wide, is 134·56 sq. ins. Find the side of each square.

Find also the width of the outer rim of another board of the same size, in which the area of each square is 1·361 sq. ins. (1882.) Ans. 1·2 ins.; 1·1$\frac{3}{4}$ ins.

(3.) If 15 trees can be planted on two square chains of ground, how many can be planted in a rectangular area 1,210 yards in length and 2,244 yards in depth? (1883.) Ans. 42,075.

(ii.) *Quadrilaterals, Parallelograms, etc.*

(4) The longer diagonal of a rhombus is 1,014 feet, the length of a side is 845 feet. Find the area of the rhombus and the length of the shorter diagonal. (1883.)

Ans. 685,464 sq. ft.; 1,352 ft.

(5.) Find the length of the side of a parallelogram, one angle being half a right-angle, the altitude being equal to half the base, and the area containing 1250 square feet. (1884.)

Ans. 50 ft., and $25\sqrt{2}$ ft.

(6.) Two adjacent sides of a field are at right-angles, and their lengths are 78 and 104 yards respectively. The other two sides form with a diagonal an equilateral triangle. Find the area of the field. (1886.) Ans. 11,373·7 sq. yds.

(7.) The sides of a field ABCD, taken in order, are 28, 45, 60 and 57 yards; the angle ABC is a right-angle. Find the area of the field in square yards. (1888.)

Ans. 2,009·6 sq. yds.

(8.) The sides of a quadrilateral are 51, 140, 148, 149 feet respectively, and the angle between the first two is a right-angle. Find the area. (1891.) Ans. 13,140·05 sq. ft.

(9.) A quadrilateral field has two sides parallel to one another, whose lengths are 8 chains 15 links and 10 chains 5 links, and the perpendicular distance between them is 6 chains. Find the area, and the rent of the field at £2 5s. per acre. (1893.) Ans. 5·46 acres; £12 5s. 8·4d.

(iii.) *Triangles, etc.*

(10.) A triangular space whose sides are in the ratio 5 : 5 : 6 contains 588 square yards. Find the length of its sides. (1881.)

Ans. 35, 35, 42 yards.

(11.) The three sides of a triangle are in the ratio of 4 : 5 : 7 and their sum equals 32 yards. Find the area of the triangle in yards. (1882.) Ans. 30·19 sq. yds.

(12.) Show that the area of a triangle whose sides are in the ratio of 3 : 3 : 4 is greater than $\frac{1}{8}$ of the area of a square described on one of the shorter sides. (1884.)

Ans. Area of triangle is to $\frac{1}{8}$ of area of square :: $\sqrt{5}$: 2.

(13.) The sum of the sides of a triangle is 24 feet. One side is 8 feet long, and the area of the triangle is 24 square feet. Find the length of the other two sides. (1885.)

Ans. 10 ft., 6 ft.

(14.) Find the cost of painting a dog-kennel 5 feet long, 2 feet wide, each side being 2 feet high, and the perpendicular height of the ridge of the roof from the ground being 3 feet 4 inches at 3d. per square foot. (1885.) Ans. 9s. 5d.

(15.) Show that the area of a triangle whose sides are 26, 35, 51 is the same as the area of a right-angled triangle whose sides about the right-angle are 7 and 120. (1889.)

Ans. 420 each.

(16.) The sides of a triangle are in the ratio of 13, 13 and 10. The area is 3,840 square yards. Find the length of each side. (1890.) Ans. 104, 104, 80.

(17.) Find the acreage of a triangular field whose sides are 2,170, 4,040, and 4,950 links. (1892.) Ans. $355\frac{1}{11}$ acres.

(iii.) *Circles, etc.* (N.B. $\pi = \frac{22}{7}$).

(18.) The length of each side of a square piece of thin metal is 4 feet, and lines are drawn parallel to each side dividing it into 9 equal squares, out of each of which the inscribed circle is punched. If the value of the whole piece of metal be £14, what is the value of these circular discs? (1886.)

Ans. £10 19s. 10·9d.

(19.) In a rectangular garden, 40 yards long, 30 yards wide, a path 5 feet wide is made running round the sides, and there are four circular flower-beds, each 28 feet in diameter. How much will it cost to cover the rest of the space with grass at 7½d. per square yard? (1887.) Ans. £22.

(20.) A circle and an equilateral triangle have the same perimeter; compare their areas. (1887.)

Ans. Area of circle : Area of triangle :: $21\sqrt{3}$: 22.

(21.) The area of a circle is 38·5 square feet. Find the area of a square whose perimeter is equal to the circumference of the circle. (1888.) Ans. $30\frac{1}{4}$ sq. ft.

(22.) The circumference of a circular field is 252 yards. If the field be worth £48 16s., find the value of a similar circular field whose circumference is 315 yards. (1889.)

Ans. £76 5s.

(23.) The diameters of the wheels of a bicycle are 48 and 14 inches respectively. Find how many revolutions the smaller wheel will make more than the large wheel in a distance of 10 miles. (1890.) Ans. 10,200.

(24.) The circumference of a circular reservoir is $553\frac{1}{7}$ yards, and the area that it occupies on a map is $\frac{11}{14}$ of a square inch. Find the scale on which the map is drawn measured by inches per mile. (1891.) Ans. 10 inches.

(25.) The rectangular frame of a circular mirror is $5\frac{1}{2}$ feet long, and $3\frac{1}{2}$ feet broad. Find the radius of the mirror when its area is equal to that of the frame. (1892.) Ans. $1\frac{3}{4}$ ft.

(26.) The area of the space between two concentric circles is 1,078 square feet. The radius of the larger circle is 28 feet. Find the radius of the inner circle. (1893.) Ans. 21 ft.

Form 20 (I.).

Report on the Qualifications of Candidates for Queen's Scholarships.

REPORT OF EXAMINATION,

held before _____ *Her Majesty's Inspector,*

at the _____ *Training College, Midsummer,* 1893.

Name of Candidate (IN FULL). *To be written in text hand.*

Surname ... _____

_____

Christian Names ... _____

_____

_____

_____

Place of Birth and County.

Date of Birth (*exact*). _____ day of _____ 18__

Whether apprenticed as a Pupil Teacher, and in what year first apprenticed?

Date of termination of Apprenticeship?

*Examples:— *Fulham, May Street Board School; Bolton, St. Mark's Nat. School.* Name of School or Schools (IN FULL*) and county in which apprenticeship was served; and Christian and Surname of Teacher, in full.

How since employed?

If you have already been a Student in a Training College, give the name of the College and the date of your admission.

If you are a Candidate for Admission to a Training College, state the name of the College, and specify whether Residential or Day.

Name (IN FULL) and *complete postal address* of the person to whom the result of Examination should be communicated. _____

_____

_____

If you have qualified in any of the subjects named below, write opposite to each subject the place and date of examination.

DRAWING EXAMINATIONS.

Subject.	Place of Examination.		Date of Examination.	For Science and Art Department.
	Town.	School or Institution.		
1. (*a*) *Freehand drawing of Ornament (Elementary Stage)*				
(*b*) Freehold drawing from flat examples (2nd Grade, 1st Class) ...				
2. (*a*) *Science Subject I. (Elementary Stage)*				
(*b*) Geometrical drawing, Section 1 of Science Subject I.				
(*b*) Geometry (2nd Grade)				
(*b*) Perspective, linear (2nd Grade, 1st Class).....				
3. (*a*) *Model drawing (Elementary Stage)*				
(*b*) Model drawing (2nd Grade, 1st Class).....				
(*b*) Model drawing with chalk on the Blackboard				
(*c*) If passed before 1893.				

SCIENCE EXAMINATIONS.

(N.B.—The numbers prefixed are those which the Subjects bear in the Science Directory.)

	Subject.	Stage (Elementary, Advanced or Honours.)	Class (I. or II.)	Place of Examination. Town.	Place of Examination. School or Institution.	Date of Examination.	For Science and Art Department.
6.	Theoretical mechanics (*a*) Solids						
	(*b*) Fluids						
8.	Sound, Light, and Heat						
	(*a*) Sound						
	(*b*) Light						
	(*c*) Heat						
9.	Magnetism and electricity						
	or Alternative Elementary Physics						
10.	Inorganic chemistry, Theoretical						
10P.	Inorganic chemistry, Practical						
11.	Organic chemistry, Theoretical						
11P.	Organic chemistry, Practical						
14.	Human physiology						
17.	Botany						
23.	Physiography						
24.	Principles of Agriculture						
25.	Hygiene						

* Candidates who attended the recent examination of the Science and Art Department and have not yet been informed of the result, should enter, opposite each of the subjects in which they were examined, the place and date of such examination.

Mark for Reading and Recitation (*only in the case of Candidates not employed in Public Elementary Schools*).

*Signed*_____

Her Majesty's Inspector.

VI. Model Answers to Queen's Scholarship Examination, 1893.

GEOGRAPHY.

Men and Women Candidates.

Thursday, July 6th, 2 to 5.

Answer the first question and four other questions. If you answer more than FIVE *questions, only the five answers coming first on your paper will be revised.*

1. Draw a map (showing the lines of Latitude and Longitude) of (*a*) Scotland, *or* (*b*) New Zealand, *or* (*c*) the Coast of North America from Labrador to the Mouth of the Mississippi.

See any good atlas.

2. Account for the phenomenon of the Midnight Sun; and for the prevailing Westerly Winds in the temperate parts of the Atlantic and Pacific Oceans.

The reason the Sun appears by Night as well as by Day in the Polar Regions in their respective Summers, is because the Earth's Axis does not vary its direction during the Revolution round the Sun, it being inclined at an angle of 23½° to the perpendicular. Therefore, for the first 6 months of the Earth's journey round the Sun, the Sun does not set in the Arctic Regions; for the next 6 months it does not set in the Antarctic Regions.

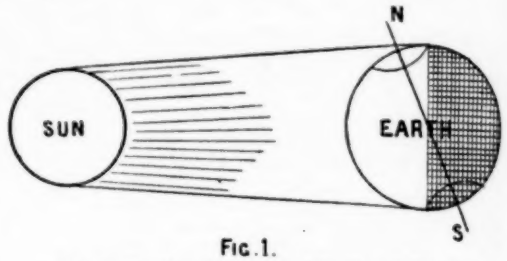


FIG. 1.

Fig. 1. Northern Summer and Southern Winter.

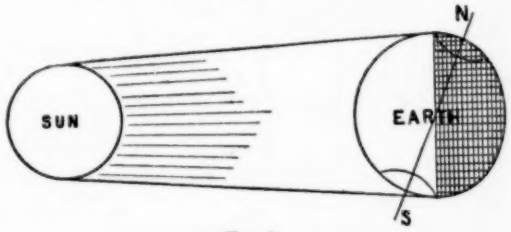


FIG. 2.

Fig. 2. Southern Summer and Northern Winter.

Because the air is very hot at the Equator it expands and rises, colder air flowing in from the N.E. and S.E. (Trade Winds); this hot air flows North and South to preserve equal pressure, and if the Earth was stationary it would flow direct North and South, but the Earth's motion is quickest at the Equator, and the air having this velocity seems to come from the N.W. in the Southern Hemisphere and from the S.W. in the Northern Hemisphere. But as this air travels Northwards or Southwards it gets colder and heavier than the air beneath it, and it therefore descends to the Earth, blowing as before S.W. or N.W. (Return Trades).

3. Name any points where the Equator cuts Asia, America, and Africa; (*b*) also any places of importance situated on or very near the 30th N. parallel, the 30th S. parallel, the 30th E. meridian, the 90th E., the 60th W. and the 90th W.

The Equator cuts—(*a*) Asia at the East India Islands, viz., Sumatra, Singapore, Borneo, and Celebes.

(*b*) Africa at Zanzibar coast, Victoria and Albert Edward Nyanza, River Congo, Congo Free State, Ogawai Settlement.

(*c*) America at River Amazon, Marajo, River Negro, Brazil, Ecuador, Quito, Cotopaxi.

Places on or near 30° N. parallel are:—California (Lower), Mexico, Texas, Mississippi, New Orleans, Florida, Canary I., Morocco, Tripoli, Egypt, Cairo, Suez, Bassorah, Khelat, Simla, Lahore, Lassa, Hankow, Shanghai.

Places on or near 30th S.P. are:—Cape Colony, Natal, R. Orange, Namaqua Land, Orange Free State, Brazil, R. Parana, Argentine Republic, Chili, Valparaiso, Perth, Eucla, Torrens, R. Darling, Liverpool Range.

Places near 30° E.L. are:—St. Petersburg, Odessa, Black Sea, Ladoga, Brusa, Scutari, Alexandria, El Obeid, Albert Nyanza, Ujiji, Pretoria, Natal.

Places near 90° E.L. are:—Yenesei, Lassa, Tibet, Dacca, Calcutta, Plassey, Andaman I., Nicobar I.

Places near 60° W.L. are:—Davis Str., Sydney (C. Breton I.), Barbadoes, Trinidad, Georgetown, R. Amazon, R. Madeira, Corrientes, Buenos Ayres, Monte Video, Falkland I.

Places near 90° W.L. are:—R. Severn, Superior, Fort William, St. Paul's, Mississippi, Chicago, Milwaukee, St. Louis, Vicksburg, New Orleans, Merida, Guatemala, Galapagos I.

4. How has their geographical position contributed to the rapid growth of Chicago, San Francisco, London, Sydney, Calcutta?

Chicago stands on L. Michigan, and is the chief outlet for grain of the United States. It stands at the head of that mighty waterway the St. Lawrence. It is the centre of a fine wheat-growing district.

San Francisco is the chief U.S. port on the Pacific coast, and has a fine harbour. Steamers connect it with Japan, China, and Australia. It is an outlet for gold and silver.

London is the centre of the Land Hemisphere, is opposite Continental countries, on fine waterway (Thames), and is the capital of a mighty empire.

Sydney is the capital of New South Wales, is on a splendid harbour, is an outlet for coal and gold, which are found in the neighbouring hills, and also for wool.

Calcutta, capital of India, is on a good waterway, the Hooghly (Ganges); it is the outlet of all the produce of the Ganges basin.

5. Name the most important present possessions of the French, Spanish, Dutch, and Danes, out of Europe, and give an account of one possession you name.

The most important French possessions are:—Algeria, Cochin China, Senegambia, Martinique, Pondicherry, Bourbon, Ogawai, etc.

Algeria is on the N. coast of Africa, between Morocco and Tunis. In the south are marshy lakes called 'Shotts.' The soil along the coast is very fertile, wheat, tobacco, and olives being the chief products. The chief article of export is esparto grass, used for making paper. The chief towns are Algiers, the capital, bombarded by Lord Exmouth (1816), Oran, Constantine.

The most important possessions of Spain are:—Philippine Islands, (Manilla), Mindanao, Caroline I., Ladrone I. (Marianne), Fernando Po, Cuba, etc.

The most important possessions of the Dutch are:—Sumatra, Java, Celebes, Moluccas, Curaçao, Dutch Guiana.

The possessions of the Danes are:—Greenland, Iceland, St. Thomas.

6. What are the most important productions of Virginia, Pittsburg, Trinidad, La Plata, Demerara, Rangoon, Queensland? Describe the situation of each.

Name.	Productions.
VIRGINIA (U.S.A.) -	Oysters, coal, iron, flour.
PITTSBURG - -	Petroleum and coal and iron.
TRINIDAD - -	Asphalt, arrowroot, sugar, cocoa.
LA PLATA - -	Hides, tallow, wheat, maize, meat, wool, skins.
DEMERARA - -	Sugar, rum, spices, bananas, rice.
RANGOON - -	Teak, gums, spices, rice, tea.
QUEENSLAND - -	Wool, gold, sugar, maize, cotton, arrowroot, tobacco, tin, silver, lead, tallow.

Name.	Situation.	
	Mathematical.	Topographical.
VIRGINIA (U.S.A.) -	76° and 79° W. Long., and 37° to 38° N. Lat.	*Boundaries*— N., Washington; E., Atlantic Ocn.; S., Carolina; W., W. Virginia.
PITTSBURG - -	80° W. Long., and 40½° N. Lat.	In W. Pennsylvania.
TRINIDAD - -	Between 62° and 60½° W. Long. and 10° and 11° N. Lat.	Off N.E. Coast of S. America.
LA PLATA - -	Between 58° and 73° W. Long. and 22° to 58° S. Lat.	*Boundaries*— N., Bolivia; E., Brazil and Atlantic Ocean; S., S. Atlantic; and W. by Chili.
DEMERARA - -	58⅓° W. Long. and 6⅝° N. Lat.	In British Guiana.
RANGOON - -	E. Long. 95°, N. Lat. 16°.	Near Mouth of Irawaddy.
QUEENSLAND -	Between E. Long. 135° and 157°; Between S. Lat. 9° and 35°.	*Boundaries*— N., Torres Str. and Gulf of Carpentaria; E., Pacific Ocean; S., N.S. Wales; W. by S. Australia.

7. Indicate, under appropriate heads, the matter with which you would deal in a full lesson to a class on either Australia *or* Italy.

Full Lesson on Australia.

Description. Large island in Southern Hemisphere south of East India Islands. Natives low, unintellectual race, who are dying out.

Climate healthy, dry, hot in north and centre, temperate in south. Water is not plentiful. Seasons opposite to English seasons.

Physical features. Mountains along E. coast:—Australian Alps (Victoria), Blue Mountains, with Kosciusko (7,300) (N.S. Wales), New England Range, Stuart and Gawler Ranges (S. Australia).

Rivers. Murray, on right bank Darling, Lachlan, Murrumbidgee drains N.S. Wales and Victoria, enters Encounter Bay; Swan, Murchison, Gascoyne, Ashburton, Fitzroy (W. Australia); Victoria, Cooper Creek (S. Australia); Gregory, Flinders, Mitchell, Burdekin, Fitzroy (Queensland).

Great Salt Desert in West Australia.
" *Victoria* " " "

Bays. Gulf of Carpentaria (North), Torres Strait, Cambridge Bay (N.); Shark Bay, Geographe Bay (W.); Australian Bight, Spencer Gulf, Gulf of St. Vincent, Encounter Bay, Bass Strait (S.); Botany Bay, Moreton Bay, Hervey Bay (E.)

Capes. C. York, Leveque (N.); North-West Cape, Steep Point, C. Leeuwin (W.); C. Otway, C. Wilson (S.); C. Howe, Sandy C. (E.)

Lakes. Torrens, Eyre, Gairdner, Amadeus (S. Australia).

Great Barrier Reef off Queensland, 1,200 miles long.

Botany is peculiar; cedar, pine, acacia, eucalyptus, vine, fig, wheat, maize.

Zoology is peculiar; kangaroo, opossum (pouched), dingo, ornithorhynchus (platypus), emu, cassowary, black swan, snakes.

Minerals. Gold (Victoria, Queensland, N.S. Wales); copper (S. Australia, Queensland); Tin (S. Australia, Queensland); Iron (in all colonies); Coal (N.S. Wales, Queensland).

Industries. Agriculture, sheep-rearing, cattle-rearing, mining, cultivating vine, sugar-cane, cotton plant.

Divisions. New South Wales, capital Sydney. Towns: Newcastle, Maitland (coal, iron), Bathurst, Paramatta (gold). Goulborn.—Victoria, capital Melbourne. Towns: Ballarat, Sandhurst, Echucha, Geelong (gold).—Queensland, capital Brisbane. Towns: Maryborough, Rockhampton, Townsville. —S. Australia, capital Adelaide. Towns: Burra Burra, Wallaro, Kooringa (copper), Augusta, Palmerston.—W. Australia, capital Perth. Towns: Fremantle, York, Eucla, Peel, Albany.

N.B.—The above is for a FULL *lesson as requested, but no class could retain a third of this information.*

VII.—Model Answers to History.

Answer FIVE *questions. If you answer more than* FIVE *questions, only the five answers coming first on your paper will be revised.*

1. Name three English kings who fell greatly under the influence of favourites, and show how the weakness of these kings contributed to the growth of constitutional freedom.

Henry III. was under the influence of Peter des *Roches*, a Poictevin, and after his (Henry's) marriage was influenced by his wife's *Provençal* relatives; these received the king's bounty, and were raised to high offices. As the barons could not stand this favouritism, they resorted to arms, and in 1258 (Provisions of Oxford) compelled the king to recognise a *council* of prelates and barons, without whose advice the king should do nothing. Henry tried to recover his power, and the result was a civil war (*Lewes*, 1264), in which the king was defeated. Then a *Parliament* was called (1265), to which came representatives of counties, cities, and boroughs.

Edward II.'s favourites were:—(*a*) *Gaveston*, whom the barons banished; but, as the king restored him, he was beheaded at Warwick, and a Council of *Ordainers* was appointed by Parliament to reform the Government. (*b*) The De Spensers, on whom he heaped undeserved honours, which roused the barons again, and the result of the struggle was that the De Spensers were hanged. Edward was deposed and afterwards cruelly murdered at Berkeley Castle (1327).

Charles I. was greatly influenced by *Buckingham*, who was impeached by Parliament, and afterwards assassinated at Portsmouth. Parliament would not grant supplies unless the king redressed grievances, therefore he tried to rule without a Parliament (1629, 1640). The Parliament had obtained in 1628 that great charter of liberties—the *Petition of Right*. The *Long* Parliament of 1640 took the Government into its own hands and executed *Strafford*, the king's chief adviser, and *Laud*, Archbishop of Canterbury, who had great influence over him (1641). When the king afterwards interfered with *Privileges of Parliament* civil war ensued, the result of which was the execution of the king in 1649 and the erection of a republic.

2. State, in a few words, what you know of any five of the following:—Doomsday Book, Scutage, the Hampton Court Conference, the Chartists, Poyning's Law, the Exclusion Bill, the Letters of Junius, the Mutiny Act.

In (1085–1086) William I. compiled the *Doomsday Book*, in which was intended to be recorded an exact account of every estate in England, by whom it was held, its extent, and the value, so that he could compel the barons to give him their full dues. It was first used at the Salisbury Gemot (1086), when William compelled every landowner to bring witnesses to swear to the extent of his estate, &c., and to pay homage to the king for his land.

Scutage was instituted by Henry II. (1159). It was money that might be paid by a knight who found it inconvenient to follow his master to the wars. It thus enabled the king to hire foreign troops; it therefore had a tendency to undermine the Feudal System. It was abolished in 1660 by Chas. II., he receiving an excise tax on liquor instead.

The *Hampton Court Conference* was held in 1604 between Puritans and Episcopalians in order that their differences might be reconciled. King James was president. Its results were:—(1) Translation of the Bible; (2) Another Revision of the Prayer Book, the Thanksgiving Prayers for Royal Family being added; (3) Articles on the Sacraments to be added to the Catechism.

The *Chartists* were a body of men who agitated the country in 1838 to obtain the so-called '*People's Charter*,' demanding Universal Suffrage, Vote by Ballot, Payment of Members, Annual Parliaments, Equal Electoral Districts, Abolition of Property Qualification. The leaders were imprisoned and the riots suppressed, special constables being enrolled. Out of a petition of 5½ million signatures only 2,000 were genuine.

Poyning's Law was passed in Henry VII.'s reign by Sir Edward Poyning. It enacted that the Irish Parliament could entertain no measure unless the Royal Council of England agreed to it.

3. State shortly the main objects of the foreign policy of Henry VIII. and of William III.

Henry VIII.'s first act was to join the Holy League in order to expel the French from Italy (1511), he hoping to obtain Guienne. Henry's allies deserted him, and he sought revenge by betrothing his sister Mary to Louis XII. But the French king soon afterwards died, and the new French king concluded a peace with Spain and Italy. Henry's policy was influenced very much by Wolsey, who aimed at the Papal Crown. An alliance was formed with France in 1518, and Henry's daughter was betrothed to the Dauphin. In the next war between Francis and Charles, Henry's policy was to hold the balance of power in his hand, and his friendship was eagerly courted by both monarchs. An alliance was made with Charles (1523), but as Charles seemed to use England for his own purposes, Henry made peace with France (1525). Foreign battles were Battle of the Spurs (1513), Flodden Field (1513), Solway Moss (1542).

Louis XIV.'s schemes were the ruin of Austria and the acquisition of the Spanish Netherlands. William III.'s policy was to thwart this, therefore England was at war with France all his reign. In 1692 the French were defeated by Russell off Cape *La Hogue*. William was defeated at *Steinkirk* (1693) and also at *Landen;* he took *Namur* (1695). Both sides being exhausted, they agreed to the peace of *Ryswick* (1697). The Spanish Netherlands were confided to Dutch garrisons, and Louis was baffled and disappointed. Louis now bent all his hopes on the Spanish Succession. In 1698 Louis and William agreed to the First *Partition* Treaty, by which the Prince of Bavaria was to take Spain and the Netherlands. The Prince dying, they made a Second Treaty (1699), by which the Archduke Charles was to take Spain and the Netherlands. The result, on the king of Spain's death, was the war of the Spanish Succession in Anne's reign.

4. What effect had the French Revolution on the leading English Statesmen of the time—Pitt, Burke, and Fox?

The French Revolution was welcomed at its outset as the emancipation of a state from tyranny, and hailed as the commencement in France of a constitutional monarchy modelled on that of England. Even when it became plain that the direction of affairs had fallen into the hands of the extreme party, their excesses were condoned by *Fox* and his followers as the errors of children, who would be corrected by the experience of responsibility. To others the whole movement was one of anarchy, the triumph of the common mob, to be mercilessly stamped out by main force. Such was the opinion of the great philosopher *Burke*. *Pitt* wavered between the two opinions until events proved that the moderate party in France could not control the course of the revolution, and then threw himself heartily into the opposite camp and accepted a policy of repression at home and war abroad, though naturally opposed to both.

5. What were Nelson's three most important victories? Give dates, and very briefly describe the events which led to the battle in each case.

Nelson's first great victory was achieved in 1797 off *Cape St. Vincent*, when he, in conjunction with Jervis, annihilated the combined fleets of France and Spain. It was fought to prevent an invasion of England by those fleets.

His second great victory was the battle of the *Nile* (1798), when he destroyed nearly all the French ships in *Aboukir Bay* It was fought to frustrate Napoleon's thought to conquer India, and also to cut off his retreat to France.

His last and greatest victory was won at *Trafalgar* in 1805. Napoleon's object was the conquest of England. Nelson completely destroyed the Franco-Spanish Fleet in this action, but was killed. He gained for England the supremacy of the seas.

6. Name three instances of the Commons exercising the right of impeachment, and in each case state briefly the charge against the accused.

Francis *Bacon*, Lord Verulam, was impeached by James I.'s third Parliament for corruption in the high office of chancellor. He was heavily fined, deprived of office, and imprisoned during the king's pleasure.

Strafford was impeached (1641) of high treason. He was accuse of illegal tyranny as deputy of Ireland, and of having advised the king to employ the Irish army to reduce the English. He was beheaded.

Archbishop *Laud* was impeached and executed (1641) for his arbitrary proceedings in church matters. He was also accused of authorising pastimes on Sundays, and of endeavouring to assimilate the Church of Scotland with that of England.

7. Arrange, in chronological order, and give the dates of the following:—

The Death of King Alfred.
The Black Death.
The Battle of Sedgemoor.
The First Reform Bill.
The South Sea Bubble.
The Roman Evacuation of Britain.

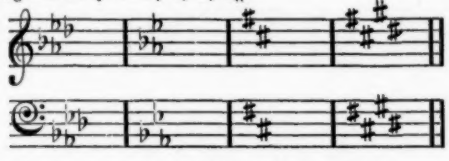
The Introduction of the Penny Post.
The Battle of Naseby.
Wyatt's Rebellion.
The Fire of London.
The Battle of Barnet.
The First Poor Law.
The Surrender of Cornwallis at Yorktown.

		A. D.
1.	Roman Evacuation of Britain	410
2.	Death of King Alfred	901
3.	Black Death	1349
4.	Battle of Barnet	1471
5.	Rising of Sir T. Wyatt	1554
6.	First Poor Law	1601
7.	Battle of Naseby	1645
8.	Fire of London	1666
9.	Battle of Sedgemoor	1685
10.	South Sea Bubble	1720
11.	Surrender of Cornwallis at Yorktown	1781
12.	First Reform Bill	1832
13.	Introduction of Penny Post	1839

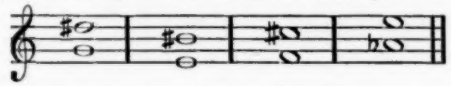
VIII. Model Answers to Music.

Staff-Notation. (*Men and Women.*)

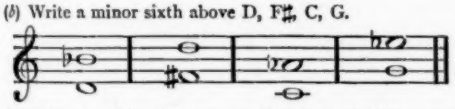
1. Write in Treble and again in the Bass Clef the signatures of the following minor keys :—F, C, B, C♯



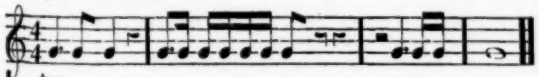
2. (*a*) Write an augmented fifth *above* G, E, F, A♭.



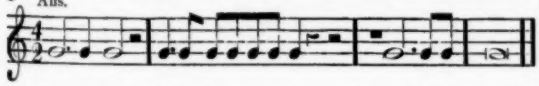
(*b*) Write a minor sixth above D, F♯, C, G.



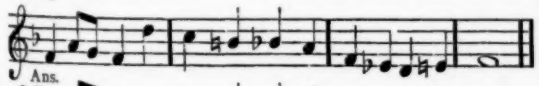
3. Re-write the following passage in $\frac{4}{2}$ time, doubling the value of every note and rest :—



Ans.



4. Transpose the following passage a major 2nd higher, viz., into key of G.



Ans.

5. State the key of

(*a*) C, A, E♭, G, B♭, F, D, C. Ans. B♭.

(*b*) F♯, A, E, G, F♯, D, C♯, G. Ans. D.

(*c*) B♭, F, A♭, E♭, D♭, G, G, B♭, E♭, G, B♭. Ans. A♭.

(*d*) D♯, E, G♯, C♯, F♯, A, D♯, G♯ Ans. E.

6. Explain the meanings of :—

Legato = Connected, *not* staccato.
Dal Segno = Repeat from the sign.
Sforzando = Forced.
Ad libitum = According to wish or taste.
Allegretto = Rather fast.
Fortissimo = Very loudly.

Tonic Sol-fa Notation.

1. Write the following values in 4-pulse measure, beginning on a strong pulse. The figures show durations in pulses or fractions of a pulse.

2½ ½ ¾ ¼ 1½ ½ ¼ ½ 1 ½ ¼ ¼ ¼ ¼ ¼ 1 ½ ¼ ¼ ¼ ¼ ½ 2

m s f t_1 d r m Rest Rest l s f m s d Rest t_1 r d t_1 Rest d

| m :— | -.s:f.,t_1 | d :-.r | m. : |

| l.s,f:m.s | d :.t_1 | r.d:t_1. | d :— ‖

2. Write (in figures) *over* each note and rest in the following its value in pulses and fractions of a pulse :—

| ¾ ¼ 1 | ½ ½ | ¼ ¼ ¼ 1½ | ½ | ¼ ¼ ¼ 2 ‖

| m., f :s | :.m | m,d.r :m | :-.f | s_1,l_1,f :m | :— ‖

N.B. Note | m., f : here probably equals | m.-, f :‖ as the latter is generally contracted into the former form.

3. Name the following intervals :—

‖ t | r_1 | ta | de' | se | d' | fe | la ‖

‖ m | f | s | f | f | m | r | t_1 ‖

Ans. Perfect Fifth. Major Sixth. Minor Third. Augmented Fifth. Augmented Second. Minor Sixth. Major Third. Diminished Seventh.

4. Re-write the following passage, making a change to the first sharp key at (*a*) and a return to the original key at (*b*) :—

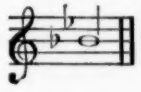
(*a*) (*b*)

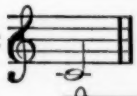
s d r t_1 m fe l s fe t d' fe s r f t_1 d.

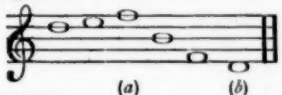
s d r t_1 ml_1 t_1 r d t_1 m f t_1 d ^{n}r f t_1 d.

5. Which one of the following notes is (*a*) highest in pitch and (*b*) which one lowest :—

f in key A ; l in key G ; s in key B♭ ; t in key C; l_1 in key A♭ ; d in key D.

N.B.—In Tonic Sol-fa, key B♭  is the highest,

and key C  the lowest ever used.



(*a*) (*b*) Ans.

6. See Staff Notation.

SELECTED GOVERNMENT QUESTIONS.

First Week.

1. Suppose we had an alphabet in which each separate sound was represented by a distinct letter, what, and how many additional vowels and consonants should we require?

2. Give some examples of each of the following, and some rules for its right use :—
The nominative absolute.
The subjunctive mood.
The gerundial infinitive.
The double negative.

3. Draw a map (showing the lines of latitude and longitude) of (*a*) Scotland, (*b*) New Zealand or (*c*) the coast of North America from Labrador to the Mouth of the Mississippi.

4. What do you know about the origin of the names in (*a*), (*b*), and (*c*) ?—
(*a*) Chester, Edinburgh, Philadelphia, Washington, St. Petersburg.
(*b*) England, France, Normandy, Austria, Lombardy.
(*c*) The Kingdom of Italy, the Kingdom of Greece, the German Empire, the United States, the Great Mogul, the Empress of India.

5. Give the chief provisions of the Treaty of Paris, 1763.

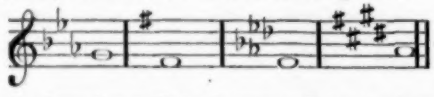
6. Point out how Anselm and Langton played an important part in English History.

7. Show in how many ways you could vary exercises in Mental Arithmetic suited either for (*a*) the upper class in an Infant School, *or* (*b*) Standard V.

8. Name any poems or verses which you would choose to be learned by heart, *either* (*a*) by infants *or* (*b*) by scholars in the Sixth Standard. Say what is the use of such memory exercises.

9. Write (*a*) a perfect or major fourth above each of the following notes :

and (*b*) a major sixth above each of the following notes :



Write (in figures) very distinctly over each note and rest in the following passage its value in pulses or fractions of a pulse :

| s :-.f,l | s .f :m . | t_1,d.r :m .,s | .r,t_1 :d . ‖

10. Find, by practice, the value of 15 tons 19 cwt. 3 qrs. 16 lbs. at £26 5s. per ton. Ans. £419 17s. 2½d.

11. (*a*) What is the rent of a farm of 179 acres 3 roods 16 poles at £1 3s. 4d. per acre? Ans. £289 16s. 6d.

(*b*) A railway train having left a terminus at noon is overtaken at 6 p.m. by another train, which left the same terminus at 1 p.m. If the former train had been 10 miles further on the road when the latter started, it would not have been overtaken till 8 p.m. Find the rates of the trains. Ans. 30 and 25 miles per hour.

12. (*Men only.*) (*a*) If a straight line be divided into any two parts, the squares on the whole line and on one of the parts are equal to twice the rectangle contained by the whole and that part, together with the square on the other part.

(*b*) If from the right angle of a right-angled triangle lines be drawn to the opposite angles of the square described on the hypotenuse, the difference of the squares on these lines is equal to the difference of the squares on the two sides of the triangle. (II. 12 may be used.)

(*Women only.*) Give directions for roasting a piece of beef. Say by what signs you would know when it was properly cooked. How would you make the gravy?

13. (*Men only.*) (*a*) $\frac{x-3}{x-4}+\frac{x-1}{2-x}=\frac{1}{12}$. Ans. $x=8$ or -2.

(*b*) Write down the cube of $(a+b-c)$ without multiplying.

Ans. $a^3+3a^2b+3ab^2+b^3-3a^2c-6abc-3b^2c+3ac^2+3bc^2-c^3$.

(*Women only.*) What constituents of our food go to sustain the warmth of the body? Explain the process, and name some kinds of food especially adapted to this purpose. What is the normal temperature of the human frame?

14. (*Men only.*) The difference between the numerator and denominator of a fraction is 8, and if each be increased by 17 the fraction becomes equal to ⅔. Find it. Ans. $\frac{7}{15}$.

(*Women only.*) What mode of investing her future savings do you consider the best for a young woman entering on the career of a schoolmistress. State what you know respecting some of the methods of investment now available for small savings.

15. (*Men only.*) Find the acreage of a triangular field whose sides are 2,170, 4,040 and 4,950 links. Ans. 355$\frac{1}{11}$ acres.

(*Women only.*) What stitches would you use in making a baby's frock, and what buttonholes at the back?

Second Week.

1. Write a short essay on '*A General Election*,' OR, Give in substance the contents of any interesting book which you have recently read.

2. Analyse the following passage, and parse the italicised words :—

> 'I *proceeded* towards London on a fine morning, no *way* uneasy about to-morrow, but *cheerful as* the birds *that* carolled by the road ; and comforted *myself* with *reflecting* that London was the *mart where* abilities of every kind were *sure* of meeting distinction and reward.'

3. How has their geographical position contributed to the rapid growth of Chicago, San Francisco, London, Sydney, Calcutta?

4. Give a summary of what you know about London under these heads—(*a*) approximate area and population, (*b*) food and fuel supply, (*c*) commercial and financial importance, and (*d*) access to watering places.

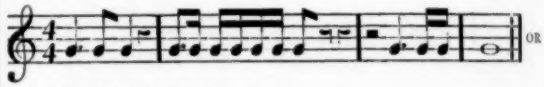
5. Give dates, or approximate dates, of :—The First Reform Bill, Capture of Gibraltar, South Sea Bubble, Capture of Quebec, Roman Evacuation of Britain, Battle of Plassey, Battle of Bosworth, First Poor Law Act.

6. What were the chief causes of enmity between England and Spain in the reign of Elizabeth, and between England and France in the reign of William III.?

7. In using a map, show how you would give a true idea of the size of a country and of the distances between important places. What use should be made, for this purpose, of the lines of latitude and longitude, and of the scale of miles? Say approximately, what is the distance of London from York, Exeter, Bedford, Norwich, and Edinburgh.

8. Make a list of object-lessons suited *either* for an infant class *or* for older children. Show in which of the subjects you would think one lesson sufficient, and to which you would assign two or more lessons.

9. Re-write the following passage in $\frac{4}{4}$ time, doubling the value of every note and rest :—



Name the following intervals :—

(*a*)	(*b*)	(*c*)	(*d*)	(*e*)	(*f*)	(*g*)	(*h*)
t	r'	ta	de'	se	d'	fe	la
m	f	s	f	f	m	r	t_1

10. (*a*) What method do you employ for the division of decimals? How would you explain it to a class?

Take as examples 691·73 ÷ ·0013, and 69·173 ÷ 31·3.

Answers. 532100 ; 2·21.

(*b*) What is meant by the ratio of two numbers? Show how the unitary method may be abbreviated by the use of ratios. Illustrate this by this example : If 5 cwt. 7 lbs. cost £3 12s., what is the price of 21 cwt. 1 qr. 14 lbs.? Ans. £15 4s.

11. What is the greatest length of which 18 yds. 1 ft. 3 in. and 20 yds. 1 ft. 9 inches are multiples? Ans. 3 ft. 3 in.

12. (*Men only.*) (*a*) The opposite sides and angles of parallelograms are equal to one another, and the diameter bisects them, that is, divides them into two equal parts.

The line which joins the middle points of the oblique sides of a quadrilateral, whose other sides are parallel to one another, is equal to the semi-sum of the two parallel sides. (Draw lines through the middle points of the oblique sides perpendicular to the parallel sides, &c.)

(*Women only.*) What rate of interest is allowed by the Post Office Savings Bank? Compute the sum which (including interest) would be saved in three years by a person who regularly placed 2s. a week in the Post Office Savings Bank. Ans. About £16 3s.

13. (*Men only.*) The price of oranges is raised 6d. per doz., and customers consequently receive 128 less than before for £1. What was the first price per doz.? Ans. 9d.

(*Women only.*) Draw out a week's table of expenditure for an artizan's family, consisting of himself, his wife, and three children from 4 to 10 years of age, the father's earnings being 30s. per week.

14. (*Men only.*) Show the L. C. M. of any two expressions is found by dividing one of the expressions by their H. C. F., and multiplying the quotient by the other expression.

(*Women only.*) Give an exact account of all the materials required, with the amount and cost of each, for the complete winter outfit of a girl of the artizan class, aged 10. Add up the total cost.

15. (*Men only.*) The rectangular frame of a circular mirror is 5½ ft. long and 3½ ft. broad. Find the radius of the mirror when its area is equal to that of the frame. Ans. 1¾ ft.

(*Women only.*) What articles of clothing should not be (*a*) starched, (*b*) mangled, (*c*) long in drying, (*d*) washed with soda?

Third Week.

1. Paraphrase the following passage :—

'Ah, what avail the largest gifts of heaven,
When drooping health and spirits go amiss ?
How tasteless then whatever can be given !
Health is the vital principal of bliss,
And exercise of health. In proof of this,
Behold the wretch who pines his life away,
Soon swallowed in disease's sad abyss ;
While he whom toil has braced or manly play,
Has light as air each limb, each thought as clear as day.'

2. Give some examples, such as would be useful in teaching Fourth Standard Scholars,—

(1) Of the same word used both as a noun and as an adjective.
(2) Of the same word used both as a verbal noun and as a participle.
(3) Of the same word used both as a conjunction and as a preposition.

3. Name the most important present possessions of the French, Spanish, Dutch, and Danes, out of Europe, and describe one of them.

4. (*a*) State the relative positions of the sun, the moon, and the earth during an eclipse of the sun, and during an eclipse of the moon.

(*b*) What is the latitude of a place (**a**) which is 10° distant from the N. Pole, (**β**) is 100° distant.

5. What were Nelson's three most important victories ? Give dates, and very briefly describe the events which led to the battle in each case.

6. What do you know about the relations between the sovereign and Parliament in the reign of Henry VIII., and between 1600–1630? Mention Acts of Parliament or historical incidents which show what were the matters in dispute.

7. If the following passage occurred in a reading-book, say what explanations you would think it necessary to give, and how you would ascertain that its meaning had been understood :—

'At the eastern end of the island was a small densely-wooded peninsula, with a thicket of under-brush so closely matted as nearly to prevent the possibility of seeing across it so long as the leaves remained on the branches. Near the narrow end that connected this acre with the rest of the island a small block-house had been erected. The logs were bullet-proof, squared and jointed with a care to leave no defenceless points ; the windows were loop-holes ; the door was heavy and small, and the roof was formed of hewn timber, covered carefully with bark to exclude the rain.'

8. Describe the best exercises you know in English Composition, and the best way of correcting them.

9. Write the signatures of the following keys:

(1) F minor. (2) B minor. (3) E minor. (4) G minor. (5) B♭ minor. (6) F♯ minor. OR,

Describe the intervals (major third, etc.) formed by the following pairs of notes:

(1)	(2)	(3)	(4)	(5)	(6)
m'	t	t	f	s	s
s	d	m	se_1	re	de

10. First, second, and third class fares are 2¾d., 1¾d., and 1d. per mile respectively, and there are 5 first class passengers to every 3 second and to every 47 third class. What sum did each class of passengers who travelled from *A* to *B* contribute to a total receipt of £53,974 16s. for fares between *A* and *B* ?

Answers. £11,244 15s. 0d.
£4,293 9s. 0d.
£38,436 12s. 0d.

11. Reduce $\frac{3}{7}$ of £7 5s. 3d. + $\frac{4}{13}$ of £17 15s. 10½d. + $\frac{5}{17}$ of £1 16s. 11d. to the fraction of £26 19s. Ans. $\frac{1}{2}$.

12. (*Men only.*) (*a.*) Define *straight line, plane angle, figure, semicircle, rhombus, axiom.*

(*b*) Construct a triangle, having given two sides and an angle opposite to one of them ; and show that there may be two solutions, one, or none.

(*Women only.*) What are the chief purposes to be served by taking food? Name several articles of food which are respectively suited to serve each of these several purposes.

13. (*Men only.*) Find H. C. F of $7x^4 - 10x^3 + 3x^2 - 4x + 4$ and $8x^4 - 13x^3 + 5x^2 - 3x + 3$. Ans. $x^2 - x + 1$.

(*Women only.*) What should be done before the arrival of a doctor in case of (*a*) convulsions in an infant, (*b*) a sprained ancle, (*c*) a deep cut, (*d*) burns and scalds, (*e*) choking.

14. (*Men only.*) Simplify

$$\frac{\frac{x}{y} - 1 + \frac{y}{x}}{\frac{x}{y} + 1 + \frac{y}{x}} \times \frac{\left(\frac{x}{y}\right)^3 - 1}{1 + \left(\frac{y}{x}\right)^2} \times \frac{y^2 + xy}{x^2 - xy} \qquad \text{Ans. } \frac{x^2}{y^2}$$

(*Women only.*) What diseases may be caused by (*a*) want of cleanliness, (*b*) insufficient exercise, (*c*) mental worry ? Give brief heads of advice on each of these points.

15. (*Men only.*) The area of a chess-board which contains 64 equal squares and an outer rim an inch wide is 134·56 square inches. Find the side of each square. Find also the width of the outer rim of another board of the same size, in which the area of each square is 1·361 inches. Answers. 1·2 inches ; 1·1⅓ inches.

(*Women only.*) Explain, as to a Second Standard, how to purl ; and as to a Sixth Standard, how to whip and set on a frill.

Fourth Week.

1. Take the following words :—*Rest, Scribe, Fort, Person, Honour, Firm, Solid, Light.* Put to each of them some prefixes and affixes, and explain how these additional syllables have modified the meaning of the root word.

2. Amplify this sentence, '*The sun shines,*' (*a*) By an adverb, (*b*) By an adverbial phrase, and (*c*) By an adverbial sentence. Explain as to a class of children the difference between these three.

3. (*a*) Why is there not always an eclipse when there is full or new moon ?

(*b*) What is the longtitude of a place where it is 6 a.m. at the same time as it is noon at Greenwich ?

4. What are the most important productions of Virginia, Pittsburg, Trinidad, La Plata, Demerara, Rangoon, Queensland ? Describe the situation of each.

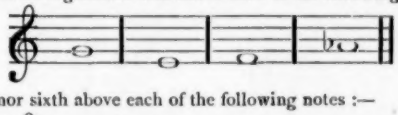
5. Give, with dates, the chief events in the reign of Henry VII.

6. Name three instances of the Commons exercising the right of impeachment, and in each case state briefly the charge against the accused.

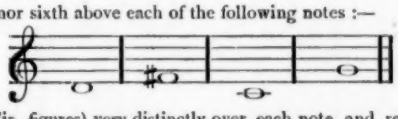
7. Write out brief notes of a lesson on one of these subjects : (*a*) Silver ; The Four Seasons ; and (*c*) (for Infants), A Blacksmith's Forge.

8. In teaching History, say what use, if any, you would make of chronological tables. Is it better to learn the date before or after the pupil knows something of an event and becomes interested in it ? Give your reasons.

9. Write an augmented fifth above each of the following notes :—



and a minor sixth above each of the following notes :—



OR

Write (in figures) very distinctly over each note and rest in the following its value in pulses or fractions of a pulse :—

| m .,f :s : .m | m,d.r :m :- .f | s,l,f :m :— ‖

10. Determine the ascending order of magnitude of the fractions $\frac{101}{180}, \frac{122}{221}, \frac{191}{346}$. Ans. As arranged.

11. Three persons invested £9,410, £3,674, and £5,216 in a business in which the net profits for a year were £1,448 15s. ; how should the net profits be divided ?

Ans. £744 19s. 2d., £290 17s. 2d., £412 18s. 8d.

12 (*Men only*). (*a*) Prove that in a right-angled triangle the middle point of the hypotenuse is equally distant from the three angles. (Draw perpendiculars from the middle point to the sides, etc.)

(*b*) In any triangle ABC, if BE, CF be perpendiculars on any line through A, and D be the bisection of BC, show that DE = DF. (Produce ED, and make use of I. 28, 26, and of (*a*).)

(*Women only.*) Why do persons who lead a sedentary life require less food than those who work in the open air.

SCHOLARSHIP OR FOURTH YEAR ROUTINE FOR OCTOBER, 1893.

DAYS	FIRST WEEK			SECOND WEEK			THIRD WEEK			FOURTH WEEK		
	I.	II.	III.	I.	II.	III.	I.	II.	III.	I.	II.	III.
MONDAY	Introduction to Algebra — Questions on Needlework	History from 1688 to 1702	Parsing and Analysis	Multiplication of Algebra — Ingredients of Food	Dates from 1688 to 1714	Study Table of English Literature	Division of Algebra — Rules of Health	History from 1714 to 1727	Parsing and Analysis	Algebraic Factors — Miscellaneous Arithmetic	Dates from 1714 to 1760	Paraphrasing and Penmanship
TUESDAY	Props. 1 and 2 of Euclid, Book II. — Calico Sampler	General Geography of North America	How to teach Mental Arithmetic	Props. 3, 4, and 5 of Euclid, Book II. — Diagram of Chemise	Revise Geography of England.	Rewards and Punishments	Props. 6 and 7 of Euclid, Book II. — Flannel Sampler	Political Geography of the United States	Physical Exercises at School	Props. 9, 10, and 11 of Euclid, Book II. — Calico Sampler	Political Geography of British North America	Mensuration of Squares *or* Clock Sums
WEDNESDAY	Cube Root — Square Root	History of English Language	Drawing	Cube Root — Present Worth and Discount	Paraphrasing and Dictation	Drawing	Cube Root — Stocks	Tables of English Literature	Drawing	Averages	Greek Roots	Drawing
THURSDAY	Addition and Subtraction of Algebra — Savings and Investments	History from 1702 to 1714	'La Jeune Sibérienne,' pp. 5 to 9, *or* 'De Bello Gallico,' Chapters 1 and 2	Multiplication of Algebra — Preparation of Food	England under the Romans	French *or* Latin Numerals	Division of Algebra — Clothing and Washing	History from 1727 to 1760	'La Jeune Sibérienne,' pp. 12 to 16, *or* 'De Bello Gallico,' Chapters 2 to 6	Algebraic Factors — Miscellaneous Arithmetic	Saxon England	'La Jeune Sibérienne,' pp. 12 to 19, *or* 'De Bello Gallico,' Chapters 4 to 8
FRIDAY	Revise first 16 Propositions of Euclid, Book I. — Flannel Sampler	General Geography of North America	Science	Deductions on Euclid, Book I. — Calico Sampler	Map of United States	Science	Revise Props. 16 to 32 of Euclid, Book I. — Diagram of Chemise	Political Geography of the United States	Science	Deductions on Euclid, Book I. — Flannel Sampler	Map of United States	Science
SATURDAY	French Nouns *or* Latin Declensions	Examination	Repetition and Literature	'La Jeune Sibérienne,' pp. 5 to 12, *or* 'De Bello Gallico,' Chapters 1 to 4	Examination	Notes in Treble and Bass Clefs *or* The Modulator.	Present Worth and Discount	Examination	Metric System	French *or* Latin Adjectives	Examination	Repetition and Literature

13 (*Men only.*) Show that the product of any four consecutive numbers, i.e., x, $x+1$, $x+2$, $x+3$ is a perfect square.
Ans. $(x^2+3x+1)^2$.

(*Women only.*) Make a careful comparison between fish and other kinds of food in respect of cost and nutritive value. State how some of the cheaper sorts of fish should be prepared for the table.

14 (*Men only.*) If p, q be the roots of the equation $x^2 - ax + b = 0$, prove that $p+q=a$ and $pq=b$.

(*Women only.*) Give a simple recipe for making (*a*) mutton broth, (*b*) pea soup, (*c*) rice pudding, (*d*) oatmeal porridge, (*e*) bread.

15. (*Men only.*) How many shrubs placed 3 yards apart can be planted round the edge of a semicircular lawn whose radius is 144 feet. Ans. 82·2656.

(*Woman only.*) Cut out and tack together a paper pattern of a full-sized shirt sleeve for a boy 8 years old.

(*For Correspondence, see end of Certificate Article.*)

NOTES ON QUICK'S EDUCATIONAL REFORMERS.

(*Special Subject set for Second-Year Certificate Students, Christmas 1893.*)

BY THOMAS CARTWRIGHT, B.A., B.SC. (LOND.),
Double Graduate in Mental Science. Author of 'Mental Science and Logic for Teachers,' etc. Co-Director of the Birkbeck Training Classes, and Lecturer therein on School Method.

PESTALOZZI (*continued*).—THE STANZ EXPERIMENT.

SWITZERLAND was overrun by the French in 1798. Five Directors, who formed the government, gladly availed themselves of the help of the radical and famous author of 'Leonard and Gertrude.' Pestalozzi became editor of a revolutionary journal, and was promised a teaching Institution in Aargau in which to advance his principles. French soldiers attacked the Catholics who refused acquiescence to French proposals, and many Swiss were slain, a result which brought about much misery, to remedy which unselfish and enthusiastic Pestalozzi readily gave up his more ambitious scheme, and set out for Stanz, on Lake Lucerne, to alleviate the misery of the orphaned and destitute. He was engaged in this work from January to June 1799, during which he accomplished much against unheard-of difficulties, which included religious and political opposition—for he was a Protestant and a revolutionary amongst conservative Catholics—ignorance on his own part as well as on the part of his pupils:—'I really could not write properly, nor read, nor reckon. At Stanz you saw that I could teach writing without myself being able to write properly'—unsuitable buildings, no apparatus, dirt, disease, and almost invincible ingratitude. Pestalozzi conquered by unparalleled devotion, which impelled him to perform for his 80 children the most disgusting offices. With patient faith he worked out his miracle of transforming squalor into cleanliness, hatred into love, and stupidity into intelligence. 'He believed, he willed, he succeeded. As far as I can judge from Pestalozzi's own teaching, the source of his strength was his belief, not in the goodness of man, but of God.'

The convent at Stanz was soon required by the French, who were retreating before the Austrians, so Pestalozzi had to break up his school; not, indeed, any too soon, as he was already habitually spitting blood, when he retired to the mountains to recruit his strength for a renewal of the struggle.

The letter to Gessner, in which he details his experiences and enumerates his principles, is of primary importance, wherefore we proceed to give an

ANALYSIS OF PESTALOZZI'S LETTER TO GESSNER.

Pestalozzi's reason for writing is his belief in the ultimate adoption of his principles: 'Some day a more fortunate posterity will certainly take up the thread of my hopes at the place where it is now broken.' He acknowledges Legrand's (one of the Five Directors) championship of his Aargau scheme, which was wrecked by the massacre at Unterwalden (September 1798). Called to Stanz. Went gladly: 'My eagerness to realise at last the great dream of my life would have led me to work on the very highest peak of the Alps.' School to be tried in the new part of the Stanz Ursuline convent. Money and support freely accorded by the Government, but building was not ready when children poured in. 'Neither kitchen, rooms, nor beds were ready to receive them.' Most of the children were 'degenerated specimens of humanity,' diseased, covered with sores and vermin, thin, haggard, careworn, shrinking; some brazen and hypocritical from begging; others with almost the very capacity of affection stamped out of them by misfortune, whilst a few spoilt children completed the heterogeneous assortment. All idle by habit. Not one in ten knew the alphabet, but 'the entire absence of school learning troubled me least; behind their coarseness, shyness, and apparent incapacity are hidden the finest faculties, the most precious powers.' '*I knew how useful the common needs of life are in teaching men the relations of things; in bringing out their natural intelligence; in forming their judgment, and in arousing faculties which, buried beneath the coarser elements of their nature, cannot become active and useful till they are set free. It was my object, then, to set free these faculties, and bring them to bear on the pure and simple circumstances of domestic life.*' Affection was to be the instrument wherewith to change the children's state, and it succeeded in doing this. His only assistant was a woman servant, for teachers of light and learning could not understand his scheme, and boors were of course of no use. Hence Pestalozzi's grand isolation. Teachers objected that his education was to be worked out without the aid of artificial means, but Pestalozzi based all his hope of success upon this very fact. He must work out the essential features of his system before he had material to place in the hands of assistants for their guidance. 'The power of the educator must be that of the father, quickened by the general circumstances of domestic life.' *School life* must be a kind of *family life*. 'Before all things I was bound to gain the love and confidence of the children.' This was to be done by untiring devotion, in order to lead to the culture of feelings and powers resulting in the child wishing and willing to do that which brings pleasure or credit; that which accomplishes his hopes or develops his powers, and brings him self-confidence. Next follows a recital which proves how thorough this devotion was. 'They forgot the world and Stanz, and only knew that they were with me and I with them.' Little appreciation was shown at first; indeed, dissatisfaction was the prevailing feeling, but Pestalozzi charitably ascribes this to sickness. Still, 'months passed before I had the satisfaction of having my hand grasped by a single

grateful parent.' Recognition came first whence it was least suspected, viz., from the Catholics; but at last it was seen that by staying with Pestalozzi the children might *both learn something and become something*, and a revulsion set in, so that 80 children were soon under Pestalozzi's system, which seems to have worked marvels with them. Love of study was engendered. 'Children, will you go to bed, or learn something?' 'Learn something!' was the usual reply. By awakening a feeling of brotherhood, Pestalozzi hoped to work out the desired regeneration, his principle being that of Christ, viz., 'Cleanse first that which is within, that the outside may be clean also.' In a word, by evoking mutual forbearance and consideration he hoped to arouse in them 'pure, moral, and noble feelings, so that, in external things, he might be assured of their ready attention, activity, and obedience.' This was the key-note to his system. The teaching was from example and not from precept, and was therefore successful. This is what Pestalozzi means when he says 'I gave my children very few explanations; I taught them neither morality nor religion.' He just awaited a fitting opportunity to make the principles self-evident from a reflection upon their actions, as in the case of the burning of Altdorf and the refugees of Grisons, etc.; in short, he gave them morality and religion in the concrete. Having awakened the sentiments, the next step was to exercise them, which Pestalozzi accordingly did, although in rather a whimsical way. Corporal punishment he finds a necessary evil: 'to win the hearts and minds of our children by words alone, without recourse to corporal punishment, is certainly good and applicable *under favourable conditions and circumstances*.' He was compelled to resort to it, but avers that no more resentment was felt towards him than is felt towards a father, adding that if the general demeanour of a teacher towards his scholars is marked by sympathy and consideration, from this their estimate of his character will be drawn, the isolated seeming exceptions when punishment was inflicted being either ignored or estimated at their true worth as necessary unto their salvation. This seems a very fair interpretation of the philosophy of the rod.

Threefold nature of moral education.

(1) Arouse the moral sense by pure feelings.
(2) Exercise self-control, so that *good* may be chosen, and evil rejected.
(3) Make children conscious of the moral rights and duties which are imposed on them by their positions.

The third aim is to be carried out by appeals similar to those given above. Reflection will show the necessity for a consideration of others if man is to live in peace and not in a state of savagery. 'If you do not willingly assist in the maintenance of order, our establishment cannot go on, you will fall back into your former condition, and your misery—now that you have become accustomed to a good home—will be greater than ever.'

A few thoughts which produced a great impression on Pestalozzi's children.

(1) If you acquire knowledge, you will be able to save many a man from evil by your counsel.
(2) Noble thoughts are necessary to the development of a wise and firm disposition.
(3) Wise instruction must take account of all our abilities and all our surroundings, and must be *simple, loving, calm*, yet energetic. It will produce an enlightened and delicate feeling for the good and the true, and will be far-reaching in its influence. Development is disturbed by a wordy system of teaching. Success depends upon personal observation and experience, hence words and explanations of them by other words were not considered of importance.
(4) Love prompted Pestalozzi to *subordinate instruction to the higher aim* of arousing and strengthening *the best sentiments* by the relations of every-day life.
(5) 'I tried to *connect the school with the workshop and make one thing of them*, caring less for the immediate gain than for the *physical training*, which, by developing their strength and skill, was bound to supply them later on with a means of livelihood.'
(6) Instruction (*i.e.* education) *should be merely an exercise of the faculties;* hence it is important to exercise the attention, observation, and memory first, so as to strengthen these faculties before calling into play the art of judging and reasoning. Hence spelling, reading, and writing are means to this end, as is also natural history.
(7) I hold it to be extremely important that men should be encouraged to learn by themselves and allowed to develop freely.
(8) Thoroughness is inculcated, and use of the 'mutual' or monitorial system is recommended.

This Stanz experiment should be closely studied. It is the first example of applied Pestalozzianism, and it is the only occasion upon which the free hand of the master was permitted to do his work to the full. It therefore yields invaluable insight into the practice and principles of this giant amongst educationists.

NEW COMPOSITION STORIES.—STANDARD V.

Suitable for 'Unseen Tests' in Reading also.

105.

A Cowardly Act.—During the Franco-German war, a Prussian trumpeter picked up a French signal-book. He saw at once a chance to secure the day, if he had coolness and determination to take it. He tried to master the French signal for retreat, and at length succeeded. Then, in the midst of a terrible rain of bullets, he hid himself in a hut in a garden, right under the enemy's lines. The odds were that he would soon be discovered and killed. But he began to blow his bugle. It was answered, and the call taken up by others. His audacious trick was a rapid triumph, for, as he sounded the retreat with still more force and assurance, the whole French detachment proceeded to retire. Hitherto they had

gained on the Germans. But their spirits failed as they found the retreat ordered, and heavy loss was inflicted.

106.

THE ABSENT-MINDED LAWYER.—A good story is told of an absent-minded lawyer, who on one occasion left his office, and on the outer door posted a card with the words, 'Back again in ten minutes. Take a seat and wait.' At the foot of the steps he happened to remember that he had forgotten something. Slowly he climbed the steps, and once more he became immersed in his own thoughts. At the door of his own office he paused and read the card on the door. Then he deliberately sat down and waited for himself to come back.

107.

HOW HE CURED THEM.—Some few years back the colonel of a regiment was much exercised in his mind as to how to deal with two of his men who were continually fighting. Threats and punishments were tried, but were of no avail; no sooner were they free than they flew at one another, and were at it again with worse results than before. At last he hit on a happy expedient. The next time the men were brought before him he set them to clean all the windows in the barracks, one inside, the other out, and after glaring at one another for three or four windows, the situation became too ludicrous, and they burst out laughing and have been good friends ever since.

108.

THE LAWYER'S ADVICE.—A man was once brought up for committing a robbery. It was found that he had no one to plead for him, so the judge told a smart young lawyer to take him into a room for five minutes and give him the best advice he could under the circumstances. At the end of five minutes, the judge sent for the lawyer and the culprit, but was astonished at seeing the lawyer enter the room without the prisoner. 'Where is the man?' said the judge. 'Gone,' said the lawyer. 'You told me to give him the best advice I could; he confessed his guilt, and I opened the window and told him to run, and by this time he is above a mile away.'

109.

A DISHONEST TRICK.—A well-dressed gentleman, sauntering about a fair with a valuable gold-headed cane in his hand, was stopped by a wretched-looking man, who had dragged himself painfully along on crutches, and piteously implored charity. The gentleman, moved to compassion, generously gave the man a piece of silver. 'How can you be so foolish?' cried a man standing by. 'That fellow is an impostor, and no more lame than you are. Just lend me your cane for a minute, and by means of a sound thrashing I will convince you of the truth of what I say.' The gentleman let the man take the cane, and the beggar, throwing down his crutches, ran off as fast as he could. The other, amidst roars of laughter from the bystanders, ran after him a considerable distance, when they turned aside into the town and were seen no more. The gentleman waited for some time, expecting to see the man return with his cane, but the expectation was in vain. It was clear that the whole scene had been an affair planned between a pair of clever rogues.

110.

ACTING A LIE.—A gentleman went into an hotel during the course of a hot morning. Whilst sitting there a man came in wearing a blue ribbon. The barmaid appeared to know what he wanted, and filled a pint glass with beer, which she set before the blue ribbonite. The latter put his finger and thumb into his waistcoat pocket and drew out a packet from which he sprinkled some powder over the top of the beer. Thinking this a queer sort of proceeding, the gentleman waited until the man had gone, and then asked the barmaid if it was really beer she had given to the teetotaler. She replied that it was beer, but explained that as the man was a teetotaler, he sprinkled it with ginger so that he could truthfully say he never drank anything stronger than ginger beer.

111.

MAKING THE TWO ENDS MEET.—Three Irishmen crossing a bridge one day, one of them, happening to look over the parapet, had a wish to touch the water; but how this was to be done puzzled them not a little. At last it struck them that by hanging from the feet of each other their wish might be accomplished. So to it they went, going over the wall of the bridge somewhat in the manner of a chain pump. After they had gone their full length, it was found that the water was still far below them. In this emergency the one at the top cried to the undermost, 'Arrah, now, Paddy, hold you on till I come down to you, and then, my honey, we shall reach it.' It is needless to add that this plan was successful.

112.

DEFRAUDING A CREDITOR.—A celebrated French poet who, in spite of his large income, was always in debt, sat one day in a barber's shop waiting to be shaved. Presently he was lathered, when the door opened and a tradesman entered who happened to be one of the poet's largest creditors. No sooner did this man see the poet than he angrily demanded his money. The latter begged him not to make a scene, saying, 'Won't you wait for the money until I am shaved?' 'Certainly,' said the other, pleased at the prospect. The poet then made the barber a

witness of the agreement, and immediately took a towel, wiped the lather from his face, and left the shop. Ever after he wore a beard.

113.

A Story of King Richard.—When the Crusaders under King Richard defeated the Saracens, the Sultan, seeing his troops fly, asked who were making all this slaughter. He was told that it was only King Richard and his men, and that they were all on foot. 'Then,' said the Sultan, 'God forbid that such a noble fellow should march on foot,' and sent him a noble charger. The messenger took it and said, 'Sire, the Sultan sends you this charger, that you may not be on foot.' The king was as cunning as his enemy, and ordered one of his squires to mount the horse in order to try him. The squire obeyed, but the animal proved fiery, and set off at full speed to the Sultan's pavilion. The Sultan expected he had got King Richard, and was not a little mortified to discover his mistake.

NEW READING TESTS.—Standard III.

Suitable for 'Unseen Tests' in Dictation also.

87. Those who have not studied the nature and habits of Pussy can have little idea what an honest and clever pet she may be made under kind and careful treatment. She can be taught, too, a large number of funny little tricks, some of which you could hardly believe possible. Now, if you wish your pussy to learn any of these small performances, you must begin to teach her when she is young.

88. A man who wanted to buy a horse asked a friend how to tell a horse's age. 'By his teeth,' was the reply. The next day the man went to a horse-dealer, who showed him a splendid black horse. The hunter opened the animal's mouth, gave a glance, and turned on his heel. 'I don't want him,' said he; 'he's thirty-two years old.' He had *counted* his teeth.

89. Night after night the poor little sufferer, not yet eleven years old, would lie awake in pain; yet he would not groan or cry out, lest he should wake the attendants who slept near him; and if he were obliged to ask for anything, it was in a tone of voice which could disturb no one. At last those weary months of suffering came to an end, and the noble-hearted boy died. (H.M.I.'s Test.)

90. The male ostrich has a glossy black back, and beautiful white feathers in wings and tail. It is these feathers which make him so valuable. Just as the English farmer shears his sheep for the sake of the wool on their backs, so the African farmer cuts off the ostrich feathers at certain times in the year, and sells them. The best will fetch £25 a pound.

91. In the slot of a signal-post where the arm works, in the station yard at Hastings, two sparrows have built their nest and laid three eggs, so that when the arm drops, the nest, being at the end, rises, and when the arm goes back so the nest drops. But this does not trouble the birds in any way, and they fly in and out the same as if they had built it in a tree or elsewhere.

92. Two dogs were once eating bones on a small lawn, at some little distance from each other. Suddenly one of them was attracted by something or other, and ran off to see what it was, leaving his bone on the grass. No sooner had he gone, than the other dog brought his bone to the place where his companion had been, dropped it there, and taking up the other dog's bone, returned to his own place with it.

93. A little girl who was walking with her mother was tempted by the sight of a basket of oranges, exposed for sale, and quietly took one; but afterwards returned it. On her return home she was discovered in tears, and on being asked the cause of her sorrow, replied, sobbing, 'Mamma, I haven't broken any of the Commandments, but I think I've cracked one a little.'

94.— Little words of kindness,
How they cheer the heart!
What a world of gladness
Will a smile impart!
Little acts of kindness,
Nothing do they cost;
Yet, when they are wanting,
Life's best charm is lost.

NEW DICTATION TESTS.—Standard IV.

Suitable for 'Unseen Tests' in Reading also.

28.

The lobster dreads thunder, and when the peals are very loud numbers of them drop their claws and swim away for deeper water. Any great fright may also induce them to drop their claws. But new claws begin at once to grow, and in a short time are as large as the old ones, and covered with hard shells. The lobster often drops its shell, when it hides until the new shell is hard enough to protect it.

29.

Cricket, being played during the summer months, has to contend with many other outdoor amusements. Many people are occupied with such pastimes as rowing, cycling, and lawn-tennis, which are largely patronised whilst the long days and the warm weather last, but football pretty well has the winter to itself, and so people who like to attend athletic games must perforce attend football matches—thus accounting for the large audiences assembled on these occasions.

30.

The brain power which Prince George possesses is inherited from the Prince Consort. He is known to be a great reader, of active habits of mind and body, punctual in the discharge of the smallest appointments, warm and constant in his friendships, endowed with a large share of practical common-sense, simple in his tastes, and, like his late brother, singularly free from any trace of self-esteem or conceit, most considerate for the feelings of others, willing to learn from all, generous and open-handed, yet careful and frugal. (H.M.I.'s Test.)

31.

The coastguard's first duty is to save life; afterwards to take charge of property cast up by the waves until claimed by its owners or the Salvage Corps. The coastguards are a most interesting body of men, and have seen life in many strange lands and on many waters. They must all have borne thirteen years' unblemished character in Her Majesty's Navy and must have won three stripes for good conduct before they can become coastguards.

32.

Most of the big spiders of the New World build nests with trap-doors, lining a hole dug in the ground with silk, fitting it with a door so artfully made that it is almost impossible to detect the fact that there is an opening, and, in some cases, actually planting seeds for the purpose of concealing it with growing plants. Some of the largest spiders catch birds, and individuals have been known to capture good-sized fish, lying in wait for them at the border of a stream.

33.

In Switzerland, girls of fourteen are employed as porters, carrying the baggage of travellers up and down the steep mountain paths. The limit to the burden often put upon them is their inability to stand up under anything more. But the burden increases with the age and strength of the burden bearers, till by the time the girls have come to womanhood there is no sort of menial toil in which they do not bear a hand, and quite commonly the chief hand.

34.

The Indians in Central America firmly believe that alligators swallow stones for the purpose of making themselves heavier, and thus capable of diving more easily. From whatever cause, the fact is certain that they do swallow stones, it being rarely the case that one is killed without one or more stones, sometimes of considerable size, being found in its stomach. The stones are of all sizes, from a mere pebble to a boulder almost the size of a man's head, and sometimes weighing as much as 40 pounds.

35.

I know in such a world as this
No one can gain his heart's desire,
Or pass the years in perfect bliss;
Like gold, we must be tried with fire;
And each shall suffer as he acts
And thinks—his own sad burden bear;
No friends can help—his sins are facts
That nothing can annul or square,
And he must bear their consequence.

STANDARDS V.–VII.

18.

The German Government have just started a scheme for the superannuation of workpeople who may become incapacitated through illness or old age. The English plan of dealing with the aged and indigent poor is to fill our workhouses with them; the German idea is the very reverse—to keep them out. The pension payable from the proposed insurance fund will of course be a very frugal, modest sum, but it will possess the golden merit of being subscribed to in part by the workpeople themselves, who are thus taught to cultivate their self-respect, a hardy plant which thrives even on the poorest and lowliest soil.

19.

An inventive genius claims to have discovered a horseshoe which requires no nails, and if the invention is as good as the tests already made would seem to indicate, the earnings of blacksmiths will be very painfully reduced. The new horseshoe is attached by a series of clamps, and can be taken off in less than a minute by anyone, although it cannot possibly be knocked off by coming in contact with the hard pavement. A special benefit claimed for the new shoe, in addition to the saving of time and trouble, is the benefit to the horse's hoof, as the shoe can be taken off at night, or, at any rate, when the horse is turned into the pasture or given an unusually long rest. Several veterinary surgeons who have tried the novelty pronounce it satisfactory and say that it will do nearly all that is claimed for it. (H.M.I.'s Test.)

20.

We did not make the world; we may mend it, and must live in it. We shall find that it abounds with fools, who are too *dull* to be employed, and knaves, who are too *sharp*. But the compound character is most common, and is that with which we shall have the most to do. As he that knows how to put proper words in proper places evinces the truest knowledge of books, so he that knows how to put fit persons in fit stations evinces the truest knowledge of men. It was observed of Elizabeth that she was weak herself, but chose wise counsellors; to which it was replied that to choose wise counsellors was, in a prince, the highest wisdom.

21.

The rapid worker has no time to get disgusted with his work; it is out of his hands long before it grows wearisome. Disgust is the product of dawdling effort. If the work be somewhat varied, the pleasure in connection with its completion is varied too. Hence, perhaps, the reason why the total and sudden giving up of work is often attended with evil results. The transition from a life full of activity, and rich in the enjoyment of successful labour, to a life of utter idleness, with no such vivid enjoyment, has often proved fatal. There is too little activity in the new life, and too little of the pleasure of activity. Idleness without the excitement and pleasure of work becomes depressing. The vital forces droop and decay.

22.

To live on your own convictions against the world is to overcome the world—to believe that what is truest for you is true for all—to abide by that, and not be over-anxious to be heard or understood or sympathised with, certain that at last all must acknowledge the same, and that while you stand firm, the world will come round to you—that is independence. It is not difficult to get away into retirement, and there live upon your own convictions; nor is it difficult to mix with men and follow their convictions; but to enter into the world, and there live out firmly and fearlessly according to your own conscience—that is Christian greatness.

23.

No young man need bemoan the fact of his having but a meagre library. It has often been the case that the finest work has been done by possessors of the fewest tools. In fact, in these days it would seem that one's danger lies in just the opposite direction. Amid the multiplicity of cheap books, one is in danger of becoming surfeited, and allowed little opportunity to think for himself, or to thoroughly digest any one of the many works thrust upon him. The reading and re-reading of a single volume has been the making of many a man. The thorough mastery of one great book will at times reveal powers of thought in the student of which he never dreamed. One is apt to dissipate his strength if he attempts to spread himself over too large a surface.

24.

A strange storm occurred recently. A yellowish cloud suddenly overspread the sky, and in another moment the rain swept down in torrents. The storm had spent itself in a few seconds, and when the inhabitants ventured out again they found the pavements strewn with mussels. The only satisfactory explanation of the phenomenon is that a passing tornado drew into the sky the waters of some river, with all the inhabitants thereof. When the great cloud thus formed subsequently burst, it rained down its living burden upon the earth again; but, unfortunately for the personal convenience of the shell-fish, it deposited them on dry land instead of into the sea. —(H.M.I.'s Test.)

25.

Lose this day loitering—'twill be the same
To-morrow, and the next more dilatory;
The indecision brings its own delays,
And days are lost lamenting over days.
Are you in earnest? Seize this very minute—
What you can do, or dream you can, begin it.
Boldness has genius, power, and magic in it.
Only engage, and then the mind grows heated,—
Begin, and then the work will be completed.

OCTOBER, 1893.

Practical Teacher Coupon.

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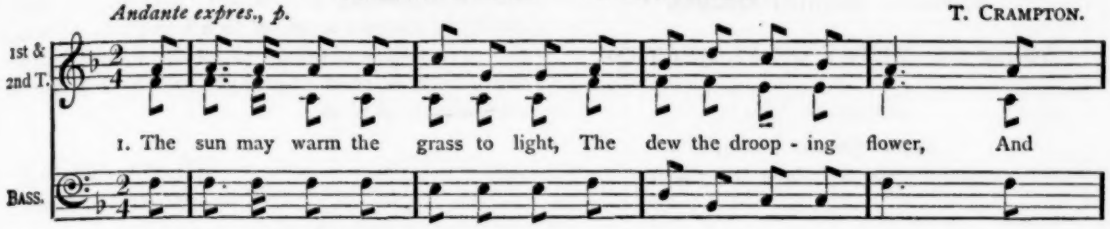
IN FUTURE

EVERY QUERY

Of whatever nature must be accompanied by the above Coupon.

GENTLE WORDS.

Andante expres., p. T. CRAMPTON.



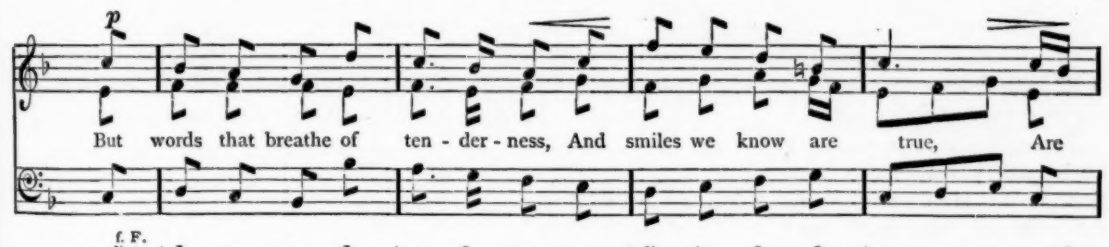
Key F. *Andante expres., p.*

1st & 2nd T. / B.

1. The sun may warm the grass to light, The dew the droop - ing flower, And

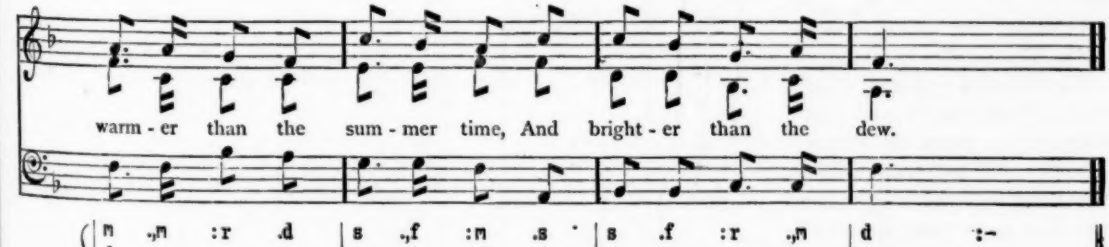
Key C.

eyes grow bright and watch the light Of autumn's op'n - ing hour.



f. F.

But words that breathe of ten - der - ness, And smiles we know are true, Are



warm-er than the sum - mer time, And bright-er than the dew.

2. It is not much the world can give
With all its subtle art,
And gold and gems are not the things
To satisfy the heart.

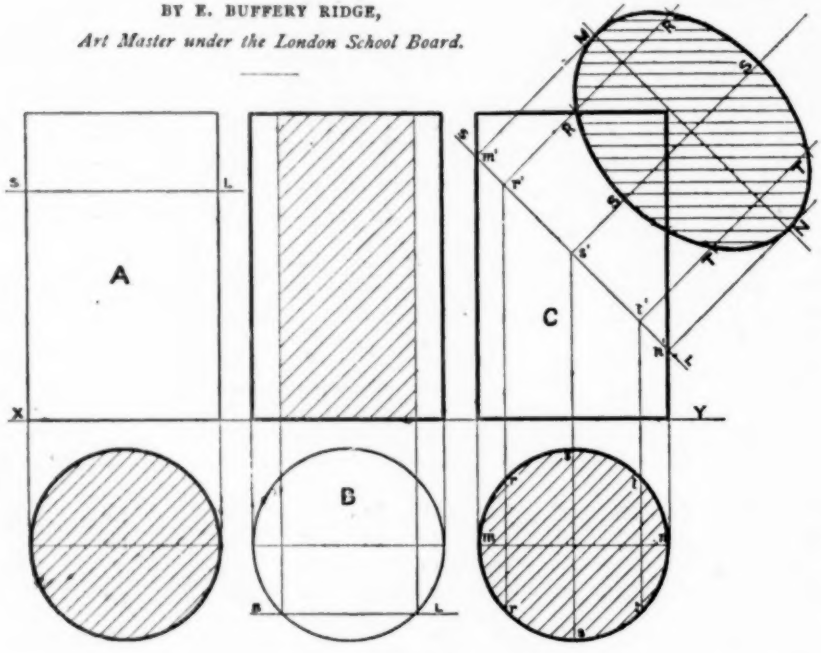
But, oh! if those who cluster round
The altar and the hearth
Have gentle words and loving smiles,
How much they glad this earth!

TEACHERS' DRAWING LESSONS.

SOLID GEOMETRY OR PROJECTION.

STANDARD VII.

BY E. BUFFERY RIDGE,
Art Master under the London School Board.



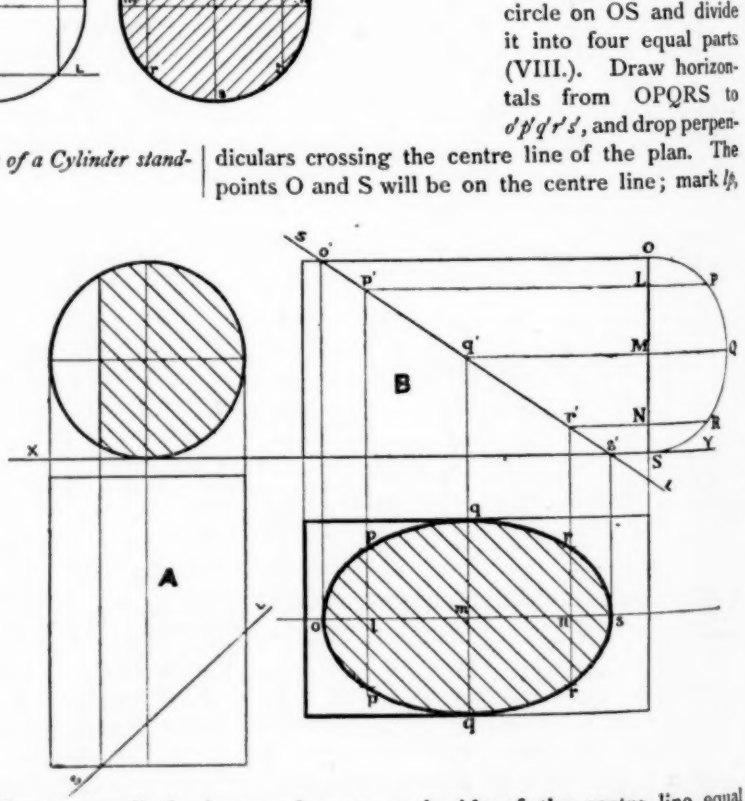
XI. *Plans, Elevations, and Sections of a Cylinder standing on one end on the ground.*

The cylinder A is cut by a horizontal plane. The section is at right angles to the axis of the solid, and shows a circle. B is cut by a vertical plane parallel to the axis. The shape of the section is a rectangle. C is cut in a slanting direction, neither perpendicular nor parallel to the axis. The section is an ellipse. All sections of cylinders except those similar to A and B are ellipses or parts of ellipses. The line *m′n′* in elevation shows the length of the ellipse, and the line *ss* in plan shows the width. The exact shape and size of the section may be obtained by marking points *m′r′s′t′n′* in the elevation, drawing a line MN parallel to *m′n′*, and lines perpendicular to *m′n′* across M N. Drop projectors from the points in elevation to cross the plan. Take the width *rr* from the centre line in plan and mark it at RR on the corresponding line in the 'true shape' figure. Similarly transfer *ss* and *tt* to SS and TT. Through the points thus obtained draw the ellipse. At *m′n′* the ellipse is seen edgeways; at MN it is laid flat on the vertical plane.

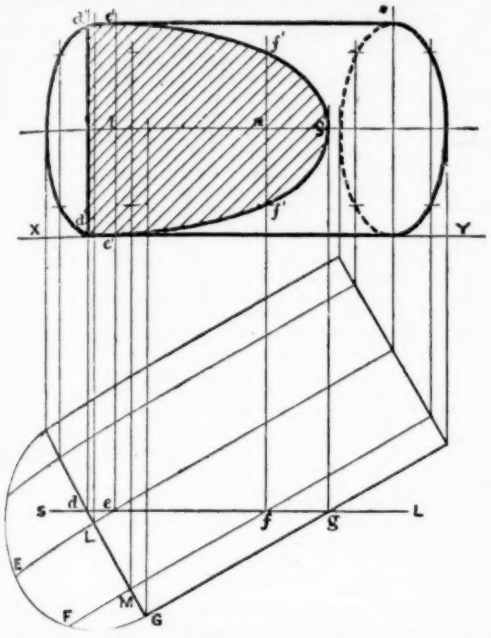
XII. *The Cylinder lying on the Horizontal Plane.*

A. Axis at right angles to the vertical plane. The section cuts off part of the front end, as is seen in elevation. It is part of an ellipse, and its true shape could be obtained in the way shown in XI., C.

B. Axis parallel to vertical plane. Plan and elevation are equal rectangles. Section an ellipse. To get the plan of section draw a semicircle on OS and divide it into four equal parts (VIII.). Draw horizontals from OPQRS to *o′p′q′r′s′*, and drop perpendiculars crossing the centre line of the plan. The points O and S will be on the centre line; mark *lq*, *mq*, and *nr* on each side of the centre line equal respectively to LP, MQ, and NR. Draw an ellipse through the points. (Upper portion removed.)

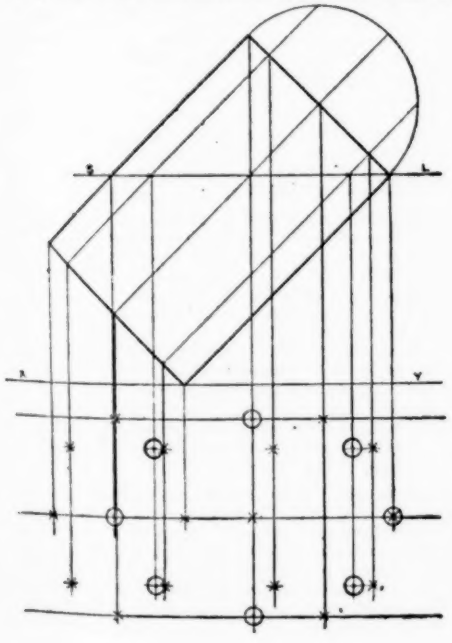


XIII. *Axis inclined* 30° *to the Vertical Plane.*



The ends of the cylinder are vertical circles; their elevations are to be obtained as in VIII., and the elevation of the section as in the last figure, B. The section cuts the end of the cylinder in a vertical line, dd'. The points *efg* in plan give rise to perpendiculars crossing the axis in elevation at lmg'. Mark l' and mf' on each side of the centre line or axis equal to LE and MF. These points, with $d'd'$ and g', enable the portion of an ellipse to be drawn showing the elevation and true shape of the section. (Front portion removed.)

XIV. *Cylinder with axis inclined to the Horizontal Plane.*

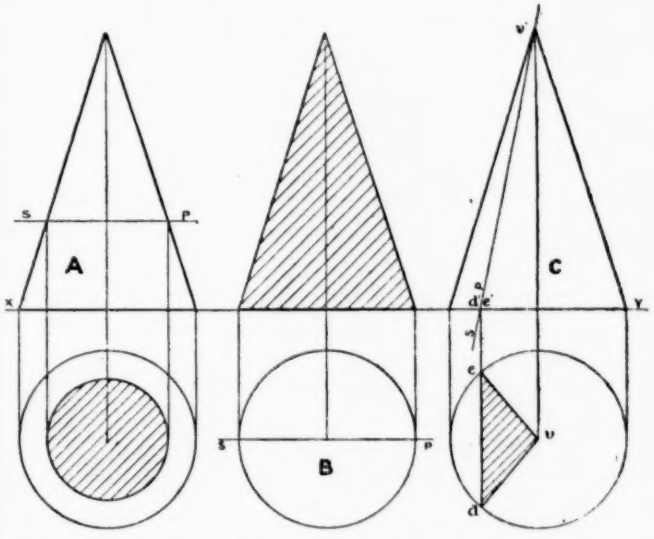


Draw plan and section.

The figure is left unfinished; the points in the plan of the section being indicated by small circles, and those in the plans of the ends of the cylinder by stars.

The right hand half of the plan of the lower end must be dotted. It is the portion nearest the ground, therefore nearest the ground-line in elevation.

XV. *Cone. Standing on its base on the Horizontal Plane.*



The elevation is a triangle, of which the *centre line* shows the *height* of the cone. The plan is a circle showing the size of the base. The plan of the apex, or vertex of the cone, is the centre of the circle.

Sections:—

A. Parallel to base. A circle.

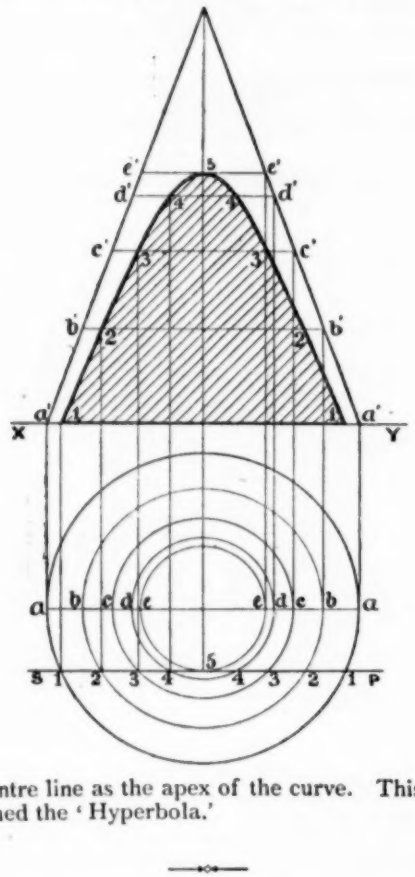
B. Containing the axis. A triangle equal to the elevation.

C. Containing the apex but not the axis. A triangle smaller than the elevation. To get the true shape of this section make an isosceles triangle on *de* with height equal to $d'v'$. It will then be seen that the section is greater in height but less in width than that in B.

XVI. *Cone. Section parallel to axis. Hyperbola.*

The section plane is vertical, shown in plan by a line which cuts the circular base of the cone at points 1 1. In elevation this circle is shown as a line $d'd'$ containing the elevations of the points 1 1. Suppose the cone to be cut by horizontal planes into slices, each section giving a circle similar to the base. Draw *bb* a circle somewhat smaller than *aa* to show the plan of one such section. A projector from *b* on the right hand side of the figure meets the side of the elevation at b', giving $b'b'$. From points 2 2 in plan draw projectors meeting $b'b'$ in points 2 2 in elevation. Similar circular sections C and D give points 3 and 4, or more if required. They should be taken nearer together as the top is approached.

Lastly the circle *ee* in plan must be drawn touching the section line at 5, giving *e'* in elevation with 5 on



the centre line as the apex of the curve. This curve is named the 'Hyperbola.'

UNSEEN FRENCH FOR CERTIFICATE STUDENTS.

"In each paper there will also be an easy unseen passage for translation into English from a prose writer."—*Regulations for Examination for Teacher's Certificate*, 1893.

We propose in this and in the two following parts of the PRACTICAL TEACHER to give extracts from French prose writers similar to those which will be set in accordance with the above regulation at the Certificate Examination in December. These extracts will also be found useful by students preparing for the London Matriculation, the College of Preceptors' Examinations, the Oxford and Cambridge Locals, and the L.L.A. of St. Andrew's.

Any difficulties which readers of the PRACTICAL TEACHER may find in them will be explained *gratis*. Write to the office of this paper, mentioning your difficulty, and enclosing the PRACTICAL TEACHER Coupon for the current month. Send a *stamped addressed envelope* for the reply.

I.

1. Quand elle eut bien étudié la ressemblance des divers animaux représentés en tête de chaque fable et de chaque histoire, elle lut attentivement les deux ouvrages, et elle s'en amusa beaucoup. Comme personne ne prit la peine d'observer les impressions que cette lecture faisait naître en son esprit, et de rectifier ses idées, toutes ces choses entrèrent dans sa tête pêle-mêle, et s'y logèrent comme elles voulurent ; les ogres qui mangent les enfants, les rats qui s'invitent à dîner, les chiens et les loups qui causent de leurs affaires, les ours qui se promènent dans les jardins, les bottes qui font sept lieues en un pas, et mille autres merveilles semblables, tout cela entra dans sa croyance sans obstacle et sans la moindre objection.—*Madame de Girardin.*

2. Les Allemands avaient surpris notre petit corps d'armée au matin ; un combat acharné s'était livré dans les vignes, autour de Wissembourg ; les nôtres manquaient d'artillerie. Nos soldats s'étaient défendus un contre six comme de vrais lions ; ils avaient même pris d'abord huit canons ; mais les Allemands arrivant toujours en plus grandes masses avaient fini par tout hacher. Ils avaient bombardé Wissembourg et mis le feu dans la ville ; quelques-uns des nôtres seulement avaient pu se retirer dans les forêts. On parlait d'un général tué, de villages en ruines. C'est à Bouxviller que mon cousin avait appris ces malheurs, des chasseurs à cheval étant arrivés le soir même. On parlait aussi de déserteurs, comme si des soldats en déroute, sans connaissance d'un pays de bois et de montagnes, allant devant eux pour échapper à l'ennemi, devaient passer pour des déserteurs.—*Erckmann-Chatrian.*

3. Vers le coucher du soleil, les trois voyageurs arrivèrent à Saint-James, petite ville qui doit son nom aux Anglais, par lesquels elle fut bâtie au xive siècle, pendant leur domination en Bretagne. Avant d'y entrer, Mdlle. de Verneuil fut témoin d'une étrange scène de guerre, à laquelle elle ne donna pas beaucoup d'attention ; elle craignit d'être reconnue par ses ennemis, et cette peur lui fit hâter sa marche. Cinq ou six mille paysans étaient campés dans un champ. Leurs costumes excluaient toute idée de guerre. Cette tumultueuse réunion d'hommes ressemblait à celle d'une grande foire. Les uns buvaient et mangeaient, les autres se battaient ou se querellaient à haute voix, mais la plupart dormaient couchés par terre. Il n'y avait aucune apparence d'ordre et de discipline. Un officier portant un uniforme rouge attira l'attention de Mdlle. de Verneuil. Elle le supposa devoir être au service de l'Angleterre. Plus loins, deux autres officiers paraissaient vouloir apprendre à quelques soldats, plus intelligents que les autres, à manœuvrer deux pièces de canon, qui semblaient former toute l'artillerie de la future armée royaliste.—*H. de Balzac.*

4. En effet, six ou sept ans se passèrent dans une tranquillité profonde, et sans que Laurent ni son frère, occupés d'achever leurs études et de réunir des statues antiques, des pierres gravées et des tableaux de l'école florentine naissante, donnassent aucune inquiétude, même à ce qui restait de vieux républicains : ils étaient tout-puissants, il est vrai, mais ils semblaient tellement eux-mêmes ignorer leur puissance, qu'on la leur pardonnait, en voyant le peu d'abus qu'ils en faisaient. De temps en temps, d'ailleurs, ils donnaient au peuple de si belles fêtes, et cela d'une façon qui paraissait si désintéressée, qu'on eût été mal venu à essayer de combattre leur popularité.—*A. Dumas.*

5. La Salle de l'Opéra italien de Berlin, bâtie durant les premières années du règne de Frédéric le Grand, était alors une des plus belles de l'Europe. L'entrée en était gratuite, le spectacle étant payé par le roi. Il fallait néanmoins des billets pour y être admis, car toutes les loges avaient leur destination fixe : ici les princes et princesses de la famille royale ; là le corps diplomatique, puis les voyageurs illustres, puis l'Académie, ailleurs les généraux. Restait, pour les bons habitants de la bonne ville de Berlin, une petite partie du parterre ; car la majeure partie était occupée par les militaires, chaque régiment ayant le droit d'y envoyer un certain nombre d'hommes par compagnie. Au lieu du peuple joyeux, impressionable et intelligent de Paris, les artistes avaient donc sous les yeux un parterre de *héros de six pieds*, comme les appelait Voltaire, le tout formant une société assez brutale, ne comprenant rien du tout, ouvrant de grands yeux, ne se permettant d'applaudir ni de siffler, par respect pour la consigne, et faisant néanmoins beaucoup de bruit par son mouvement perpétuel.—*Georges Sand.*

6. Trois libraires soupaient ensemble au cabaret : la conversation tomba sur la rareté des bons livres nouveaux. "Mes amis," dit là-dessus un des convives, "je vous dirai confidemment que j'ai fait un beau coup ces jours passés : j'ai acheté une copie qui me coûte un peu cher, à la vérité, mais c'est de l'or en barre." Un autre libraire prit alors la parole, et se vanta pareillement d'avoir fait une emplette excellente le jour précédent. "Et moi, Messieurs," s'écria le troisième à son tour, "je vais vous montrer la perle des manuscrits ; j'en ai fait aujourd'hui l'heureuse acquisition." En même temps, chacun tira de sa poche la précieuse copie qu'il disait avoir achetée ; et comme il se trouva que c'était une nouvelle pièce de théâtre intitulée *le juif errant*, ils furent fort étonnés quand ils virent que c'était le même ouvrage qui leur avait été vendu à tous trois séparement.—*Le Sage.*

7. J'avais un assez grand nombre de connaissances mais deux seuls amis de choix, Diderot et Grimm. Par un effet du désir que j'ai de rassembler tout ce qui m'est cher, j'étais trop l'ami des deux pour qu'ils ne le fussent pas l'un de l'autre. Je les liai ; ils se convinrent, et s'unirent encore plus étroitement entre eux qu'avec moi. Diderot avait des connaissances sans nombre ; mais Grimm, étranger et nouveau venu, avait besoin d'en faire. Je ne demandais pas mieux que de lui en procurer. Tous mes amis devinrent les siens,

cela était tout simple ; mais aucun des siens ne devint jamais le mien, voilà ce qui l'était moins.—*J. J. Rousseau.*

8. C'était dimanche ; les cloches appelaient les fidèles au temple, et leur son monotone ramenait du calme dans mon âme. Elles se turent, et le silence des rues encouragea ma pensée, qui s'était portée au delà des obstacles. Bientôt l'harmonie des chants sacrés, le son grave des orgues se mêlant doucement à ma rêverie, j'en vins insensiblement à me figurer moi-même au milieu des fidèles, jouissant d'un tranquille bonheur auprès de ma compagne, tous les deux lisant au même psaume, ses belles paupières baissées sur le livre, son haleine se mêlant à la mienne, et une douce félicité devenue notre partage sur cette terre et notre commune attente dans l'autre. —*Töpffer.*

9. Dans ma prison j'avais pour toute distraction, pour unique plaisir, pour seule compagnie, de petites araignées, que j'observais durant des heures entières ; mais j'en avais déjà tant observé ! Les rats non plus ne manquaient point dans mon cachot. Je m'en étais aussi fait des amis ; cependant ces animaux m'ont toujours causé un effroi, un dégoût invincibles. Je les nourrissais de mon mieux, tout en me défendant de leur approche et de leur contact. Mais les soins que je donnais à mes araignées, la terreur que m'inspiraient mes pauvres vilains rats, ne suffisaient point à mon entière préoccupation, et le désespoir s'emparait de moi en songeant à ma fille.—*Saintine.*

10. Maintenant, quand je recherche bien dans ma pensée toutes mes impressions de Rome, je n'en trouve que deux qui effacent, ou qui du moins dominent toutes les autres : le Colisée, cet ouvrage du peuple romain ; Saint-Pierre, ce chef-d'œuvre du catholicisme. Le Colisée est le trace gigantesque d'un peuple surhumain, qui élevait pour son orgueil et ses plaisirs féroces des monuments capables de contenir toute une nation, monuments rivalisant par la masse et par la durée avec les œuvres mêmes de la nature. Le Tibre aura tari dans ses rives de boue, que le Colisée le dominera encore. Saint-Pierre est l'œuvre d'une pensée, d'une religion, de l'humanité tout entière à une époque du monde ! Ce n'est plus là un édifice à contenir un vil peuple : c'est un temple destiné à contenir toute la philosophie, toutes les prières, toute la grandeur, toute la pensée de l'homme. Les murs semblent s'élever et se grandir, non plus à la proportion d'un peuple, mais à la proportion de Dieu.—*Lamartine.*

11. On fut bien plus surpris encore quand on le vit renoncer tout d'un coup aux amusements les plus innocents de la jeunesse. Du moment qu'il se prépara à la guerre, il commença une vie toute nouvelle, dont il ne s'est jamais depuis écarté un seul moment. Plein de l'idée d'Alexandre et de César, il se proposa d'imiter tout de ces deux conquérants, hors leurs vices. Il avait aimé le faste dans ses habits ; il ne fut vêtu depuis que comme un simple soldat. Il résolut de s'abstenir de vin tout le reste de sa vie. Les uns m'ont dit qu'il n'avait pris ce parti que pour dompter en tout la nature, et pour ajouter une nouvelle vertu à son héroïsme ; mais le plus grand nombre m'a assuré qu'il voulut par-là se punir d'un excès qu'il avait commis, et d'un affront qu'il avait fait à table à une femme, en présence même de la reine sa mère.—*Voltaire.*

12. Il arrivé à la porte d'une ancienne mosquée convertie en église par les fidèles. Le cœur saisi de tristesse et de religion, il pénètre dans le temple, qui fut autrefois celui de son Dieu et de sa patrie. La prière venait de finir ; il n'y avait plus personne dans l'église. Une sainte obscurité régnait à travers une multitude de colonnes, qui ressemblaient aux troncs des arbres d'une forêt régulièrement plantée. L'architecture légère des Arabes s'était mariée à l'architecture gothique, et, sans rien perdre de son élégance, elle avait pris une gravité plus convenable aux méditations. Quelques lampes éclairaient à peine les enfoncements des voûtes, mais, à la clarté de plusieurs cierges allumés, on voyait encore briller l'autel du sanctuaire : il étincelait d'or et de pierreries.—*Chateaubriand.*

OUR 1893 CERTIFICATE CLASS.

BY DR. GEORGE BEACH, M.A.,

Co-Author of a 'Manual of our Mother Tongue,' 'A Girls' Arithmetic,' Author of 'Elements of English,' 'Entertaining Readers,' 'Historical Readers,' etc.

I. QUESTIONS ALREADY SET UPON 'HAMLET.'

1. Paraphrase lines 57 to 66 of Scene 3, Act 3. (1880.)

2. Analyse the above passage and parse *shove, by, prize, out, there, compelled, then, try, can.* (1880.)

3. Name and distinguish the principal characters in the play. (1880.)

4. Explain in simple language the way in which Hamlet brings home to his mother and to the king the murder which had been committed. (1880.)

5. Give instances of certain sayings in the play which have become almost household words. (1880.)

6. Paraphrase lines 102 to 106, Scene 1, Act 2. (1887.)

7. ,, ,, 11 ,, 15 ,, 3, ,, 3. (1887.)

8. Explain *eight* of the following :—*then no planets strike—like Niobe—the Nemean lion's nerve—the paragon of animals—the altitude of a chopine—of the chameleon's dish—the mutines in the bilboes—this quarry cries on havoc—I bought an unction of a mountebank—tempered to the oaten flute—Bellerus old—built in the eclipse.* (1887.)

9. Explain *two* of the following passages, stating the circumstances under which they occur :—

(α) '*Unhousel'd, disappointed, unanel'd*'

(β) '*The other motive,*
Why to a public count I might not go,
Is the great love the general gender bear him.'

(γ) '*And the moist star,*
Upon whose influence Neptune's empire stands,
Was sick almost to domesday with eclipse' (1887.)

10. Sketch briefly the character of Polonius. (1887.)

11. Paraphrase the following passage and explain fully the connexion in which it stands :—Lines 152 to 163 of Scene 1, Act III. (1887.)

12. Paraphrase the following passage and explain fully the connexion in which it stands :—Lines 11 to 23 of Scene 3, Act III. (1887.)

13. Say in what sense Shakespeare used the following words, and give the derivation in each case :—*Censure, clepe, cerements, unanealed, lazar-like, gyves, fantasy, conceit, unction, occulted.* (1887.)

14. Analyse the passage :—

'*What would he do*
Had he the motive and the cue for passion
That I have ?' (1887.)

15. Comment on the grammar of the following passages, and parse the words printed in italics :—

(α) *Pray* you, no more,
(β) Tell me, *he* that knows,
(γ) *Shall* we to the court ?
(δ) *Rich* gifts *wax* poor.
(ε) Try what repentance *can.* (1887.)

16. Take *one* of these characters :—*Polonius, Laertes, Osric,* and say what part he plays in the drama, illustrating your answer by quotations. (1887.)

17. What inference may be drawn from the play of 'Hamlet' respecting the state of the drama, and of theatrical representation in Shakespeare's time ? (1887.)

18. Explain why it is that so high a rank is usually assigned to 'Hamlet' as a work of dramatic art. What are the special literary gifts and powers which are exhibited in this play ? What other dramas of Shakepeare's are usually classed with 'Hamlet' as belonging to the same period ? (1887.)

19. Quote from 'Hamlet' any passages which you consider especially memorable, on account of either

(α) The beauty of the expression, OR
(β) The worth of the truth expressed. (1887.)

From the above queries and those set fortnightly in our examination papers, the species of questions set and the requisite information may easily be apprehended by the average reader.

In the next two articles we hope to give similar helps in '*Paradise Lost,*' '*Gareth and Lynette,*' '*Geraint and Enid,*' and perhaps *Trench.*

II. GEOGRAPHICAL ITEMS.

(*a*) SIAM.—During the last few months Siam has attracted increasing attention owing to the encroachments of the French along the eastern bank of the Mekong River. All arguments of the Siamese have been met by a series of ultimata and increased demands, and the weak barbaric Asiatic state has had to bow to the strong civilised European one.

The chief concern of England was to prevent the French accessions of territory from becoming contiguous with British Burmah, and English commerce from being shut out of the regions N. and E. of Burmah. Although the British first reached the country in 1612, yet it is not doubtful that the French have from

1683 been connected more intimately with Siam, and have even since 1856 extended over it a kind of protectorate.

However, British commerce has preponderated in Siam and aroused French jealousy, which desires it altogether to be excluded.

Negotiations between us and our neighbours are still pending; the principle of a 'buffer state' between English and French Asia has been agreed upon, but our trade will labour under additional difficulties.

Since the accession of the present king, Chulalouco I., a great advance has been made in the national character, and a wider liberality of views has prevailed. Distinguished Siamese have been educated at our universities, and only recently the writer of this article dined with several students of that land at the Middle Temple.

The area of Siam is about 250,000 square miles, but there is no accurately defined boundary on the N. and N.E. The population is sparse, numbering only 24 to the square mile, and amounting to nearly 6,000,000. Besides the province of Batabang in Cambodia, and the northern Malay States of Kedah, Patani, Ligor, etc., Siam proper embraces the fertile alluvial basin of the Menam, which flowing into the Gulf of Siam forms a fruitful delta, where is situated Bangkok the capital.

Bangkok itself is 30 miles from the mouth of the river, and spreads over the banks into the stream, where floating and pile-built houses accommodate a very large part of the population. Here are to be found river shops, and even river markets, where tiger-skins, water-jars, fruit, cakes, betel, are sold, and where Birmingham wares and Lancashire textiles are very conspicuous.

The productions of Siam are many and diverse, no part of the East being more celebrated for the variety, abundance, and quality of its fruits, among which may be named the mango, mangosteen, litchi, durian, banana, pomegranate, guava, pine-apple, and, in brief, all the fruits of S.E. Asia, the East Indies, and Tropical America.

The cultivation of the sugar-cane is carried on extensively; rice, black pepper, sugar, maize, indigo, tobacco, and excellent cotton, are largely grown; cardamoms and gamboge are obtained from the forests of Cambodia. Other valuable forest products are teak, bamboo, rattans, scented aloe, sappan wood, and gutta percha.

The principal animals are tiger, leopard, bear, otter, musk-civet, cat, dog, porcupine, squirrel, rat, mouse, ape, deer, sheep, goat, ox, buffalo, horse, hog, rhinoceros, and elephant.

The birds comprise geese, ducks, boobies, cormorants, king-fishers, storks, pelicans, peacocks, pheasants, pigeons, and in the islands are large flocks of the swallows that produce the renowned edible nests, which find so ready a sale in the Chinese markets.

Crocodiles, lizards, tortoises, and turtles are numerous, and the python also appears, but the only insect of note is the *coccus lacca*, which yields the valuable gum and dye—the lac of commerce.

Of minerals, gold of tolerable purity is widely diffused, and tin, iron, copper, lead, zinc, and antimony, are found and worked. The sapphire, ruby, and topaz, are not infrequent on the E. of the gulf.

The people are of Mongolian race, vain but polite, superstitious but tolerant, indolent and cowardly but kind-hearted. They soon acquire a veneer of civilisation, but inevitably relapse from Western progress and ideas, the stimulus of contact with Europeans being withdrawn.

So attractive being the circumstances of Siam, so great being the potentialities of commerce, it is no wonder that France has been unable to resist the temptation of profitable and easy aggression. Information respecting Siam is in most '*geographies*' so meagre, and the temptation to the examiner in view also of recent events is so great, that we feel sure our readers will welcome this somewhat lengthy notice.

(*b*) The Canadian Government seems fully alive to the possibilities of its PACIFIC RAILWAY. It has subsidised the company and enabled it to open a new route to New Zealand and Australia *viâ* Honolulu. For the present, five large steamers are employed to establish a thoroughly efficient monthly service, bringing Sydney within 32 days of Liverpool. The Atlantic passage to Montreal occupies nearly six days, the railway journey to Vancouver 5 days, the Pacific voyage 21 days. The Sandwich Isles and Brisbane are touched at *en route*.

III. MATHEMATICAL HINTS AND EXAMPLES.

A. ABC is a triangle, and AD is the perpendicular from A on BC. If AD = 13 ft., and the lengths of the perpendiculars from D on AB and AC be 5 ft. and 10·4 ft. respectively, find the sides and area of the triangle.

Let AE = x.

By Euclid I. 47

$AD^2 = DE^2 + AE^2$;

$\therefore (13)^2 = 5^2 + x^2$;

$\therefore 169 = 25 + x^2$; $\therefore 144 = x^2$; $\therefore 12 = x$, *i.e.* AE = 12.

Let AF = y;

Then $(13)^2 = (10{\cdot}4)^2 + y^2$.

$\therefore 169 = 108{\cdot}16 + y^2$.

$\therefore 60{\cdot}84 = y^2$; $\therefore 7{\cdot}8 = y$, *i.e.* AF = 7·8.

Let BE = b.

,, CF = a.

,, BD = d.

,, CD = c.

Then we have from I. 47 the four following equations from which the four unknowns may be determined :—

(I.) $(12 + b)^2 = (13)^2 + d^2$.

(II.) $(7{\cdot}8 + a)^2 = (13)^2 + c^2$.

(III.) $d^2 = b^2 + (5)^2$.

(IV.) $c^2 = (10{\cdot}4)^2 + a^2$.

(V.) $(12 + b)^2 = (13)^2 + b^2 + 5^2$ (from I. & III.).

$\therefore 144 + 24b + b^2 = 169 + b^2 + 25$.

$\therefore 24b = 50$.

$\therefore b = \frac{25}{12}$; $\therefore$ AB $= 12 + \frac{25}{12} = \frac{169}{12}$.

(VI.) $(7{\cdot}8 + a)^2 = (13)^2 + (10{\cdot}4)^2 + a^2$ (from II. and IV.).

$\therefore 60{\cdot}84 + 15{\cdot}6a + a^2 = 169 + 108{\cdot}16 + a^2$.

$\therefore 15{\cdot}6a = 216{\cdot}32$.

$\therefore a = 13{\cdot}9$ nearly.

$\therefore$ AC $= 7{\cdot}8 + 13{\cdot}9 = 21{\cdot}7$ nearly.

Now BD $= \sqrt{(\frac{25}{12})^2 + 5^2} = \sqrt{\frac{4225}{144}} = \frac{65}{12} = 5{\cdot}42$ nearly.

,, DC $= \sqrt{(13{\cdot}9)^2 + (10{\cdot}4)^2} = \sqrt{301{\cdot}37} = 17{\cdot}4$ nearly.

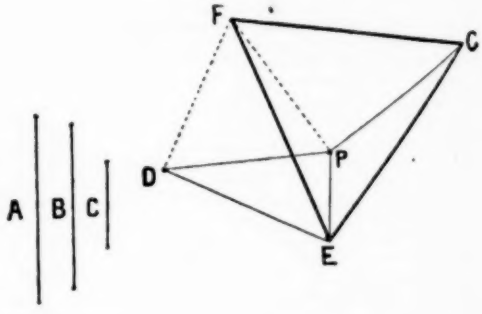
$\therefore$ BC $= 5{\cdot}42 + 17{\cdot}4 = 22{\cdot}82$ nearly.

$$\text{Area} = \frac{\text{BC}}{2} \times \text{AD} = 11{\cdot}41 \times 13.$$

$$= \underline{148{\cdot}33}.$$

B. Show how to construct an equilateral triangle, having given three lines severally equal to the distance from its angular points to a point within it. (Stage I. 1884.)

Let P be the point within the required triangle, and A, B, and C the lengths of the lines from P to the angular points of the required equilateral triangle.



Construction.—

Make the triangle PDE having PD = A, DE = B, EP = C. (I. 23).

On PD describe an equilateral triangle PFD (I. 1); join FE.

On FE describe the equilateral triangle FGE (I. 1).

Then FEG is the triangle required.

Join PG.

$\angle$ DFP = one third of two right $\angle$s $\}$ $\therefore \angle$ DFP = $\angle$ GFE

$\angle$ GFE = ,, ,, ,, ,, $\}$ omit $\angle$ PFE.

$\therefore \angle$ DFE = $\angle$ GFP $\}$ $\therefore$ DE = PG (I. 4).

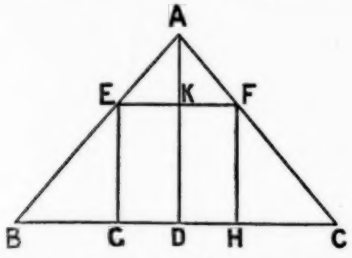
and DF = FP $\}$ But DE = B; $\therefore$ PG = B.

,, EF = FG $\}$

Also PF = PD = A. PE = C. $\therefore$ EFG is the required equilateral triangle.

C. ABC is a triangle. A square is described with two angular points on BC, and one angular point on each of the sides CA and CB. If a = BC, r = perpendicular from A to BC, and v = side of square, show that $ar = v\,(a + r)$.

$$\frac{BC \times AD}{2} = \frac{BG \times EG}{2} + \overline{GH}^2 + \frac{CH \times FH}{2} + \frac{EF \times AK}{2}$$



$\therefore BC \times AD = BG + EG \times 2\overline{GH}^2 + CH \times FH + EF \times AK.$

$\therefore ar = BG \times v + 2v^2 + CH \times v + v\,(r - v).$

$ar = (a - v - CH)\,v + 2v^2 + CH \times v + vr - v^2.$

$ar = av - v^2 - v.\,CH + 2v^2 + CH \times v + vr - v^2.$

$ar = av + vr = v\,(a - r).$—Q. E. D.

D. Find a and b, so that $x^3 + ax^2 + 11x + 6$ and $x^3 + bx + 14x + 8$ may have a common measure of the form $x^2 + Ax + B$.

$x^3 + ax^2 + 11x + 6)x^3 + bx^2 + 14x + 8(1$

$x^3 + ax^2 + 11x + 6$

$(b-a)x^2 + 3x + 2$

Now because the common measure is of the form x^2, etc., then $(b-a)x^2 = x^2$; $\therefore b - a = 1$. Eliminate $(b-a)$ and continue the process.

$x^2 + 3x + 2)x^3 + ax^2 + 11x + 6(x + 3$

$x^3 + 3x^2 + 2x$

$(a-3)x^2 + 9x + 6$

$3x^2 + 9x + 6$

$\therefore a - 3$ must $= 3$; *i.e.* $a = 6$

But $b - a = 1$; $\therefore b - 6 = 1$; $\therefore b = 7$ } —Q. E. D.

IV. The Difficult Words to be parsed from Routine are as follows:—

FIRST YEAR.

(*a*) (*Men.*) *Then, beaten, broad, Doorm, whom, on, when, ride, many, than, yestermorn, well-nigh, cheerful, till, waving, should.* (First Friday.)

(*b*) (*Women.*) *Too, rue, that, hath, Heaven, all, host, laid, as, far, as, can, for, invincible, though, glory, extinct, up.* (First Friday.)

(*c*) (*Men.*) *Damsel's, slew, either, Fie, knight, given, but, kitchen-knave, ere, could, past, without, murmuring.* (Second Friday.)

(*d*) (*Women.*) *Thrones, hath, us, though, undismayed, hard, that, out of, outrageous, immures, ninefold, passed, if, any, pass, wide-gaping, plunged.* (Second Friday.)

(*e*) (*Men.*) *When, brought, home, sideways, glance, where, own, doom, that, cross, sighed, labourer, dinnerless, blaze.* (Third Monday.)

SECOND YEAR.

(*f*) (*Men.*) *As for First Friday of First Year.* (First Monday.)

(*g*) (*Women.*) *Yet, Hamlet, be, it, to be contracted, hath, that, we, together, with, therefore, sometime, jointress, as, 'twere, weighing.* (First Monday.)

(*h*) (*Men.*) *were, done, when, well, could, catch, success, that, but, be-all, jump, to come, which, being taught, own.* (Second Friday.)

(*i*) (*Women.*) *Ay, springes, to catch, when, blazes, giving, than, heat, extinct, even, as, a-making, must, something, that, walk.* (Second Friday.)

V. The names of all candidates for certificates, not being students in any Training College, must be notified to the Education Department before the 1st of October. Each Acting Teacher should see that his name is duly entered on Form IX., with the words '*Christmas Examination*' appended.

Second Year Students who passed last Xmas lower than First Class, may sit again this December without waiting the lapse of another year.

SELECTED GOVERNMENT QUESTIONS.

FIRST YEAR.

First Week.

1. Write in Large-hand the words '*Jupiter's Moons.*'
Write in Small-hand the lines :—

'*His artless lips with berries dyed,*
And feet through ragged shoes descried.'

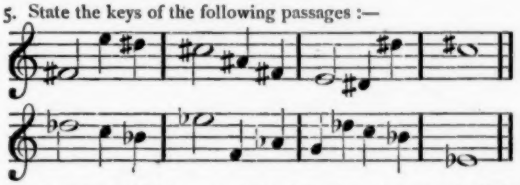
2. Write from Dictation :—

'Something in itself impossible is involved in the thought that a force which increases constantly, should, nevertheless, furnish the occasion for a second kind of action only by sudden increments or discontinuously ; and if not thus, then not at all. There are, then, doubtless, contrivances conceivable by means of which this discontinuity of the sensation could be produced.'

3. Say what is the earliest form of mental power observable in the history of a young child, and show by what sort of school exercises you could encourage and develop it.

4. Describe in words and with your own diagrams a suitable elementary course of freehand drawing, *either* (*a*) for an infant school *or* (*b*) for a school for older children.

5. State the keys of the following passages :—



(*Tonic Solfa.*) Which one of the following six notes is highest and which one is lowest in pitch?

(*a*) r in Key A ; (*b*) m in Key B♭ ; (*c*) t, in Key C ; (*d*) l in Key A♭ ; (*e*) l in Key C ; (*f*) t in Key D.

6. Write out the sharps and flats in the order of their introduction.

Note Tests for Division II. include :—'*A passage introducing the tones of the Doh Chord in any order, and the other tones in stepwise succession.*' Write two passages of twenty notes each (without time) (*a*) in Key A, and (*b*) another in Key D, in accordance with these requirements.

7. Assign to Tennyson *or* Milton his place in English literature. What do you think the finest of his works? Give reasons.

8. Analyse the following lines and parse the words in italics :—

(*Men only.*)

'*If* some *other* told,
How once the wandering *forester* at dawn,
Far over the blue tarns and hazy seas,
On Caer-Eryri's *highest found* the King,
A naked *babe*, of whom the Prophet *spake*,
He passes to the Isle Avilion,
He passes and is healed and cannot *die*—
Gareth was *glad.*'

(*Women only.*)

'He now prepared
To speak ; whereat their doubled *ranks* they bend
From wing to wing, and *half* enclose him *round*
With all his peers : attention held them *mute.*
Thrice he assayed, and thrice, in spite of scorn,
Tears, *such as* angels weep, burst *forth ;* at *last*
Words, *interwove* with sighs, *found* out their way.'

9. Draw a map of Palestine.

10. Classify the countries of Asia either as independent or governed by an European power. Give also their capitals, areas, and populations.

11. Give the chief provisions of 'The Toleration Act,' Act of Union between England and Scotland, Act of Union between Great Britain and Ireland, and the chief demands of the 'Chartists.'

12. (*Men only.*) What do you know of 'The Letters of Junius,' 'The South Sea Bubble,' 'The alteration of the Calendar,' and 'Dr. Sacheverell'?

(*Women only.*) When were the following places captured, and under what circumstances—Isle of Ely, Drogheda, Calais, Gibraltar, Quebec, and Ciudad Rodrigo?

13. A person wishes to make an income of £100 per annum by investing £2,666 13s. 4d. in the 3 per cent. consols. What must be their price? Ans. 80.

14. (*Men only.*) Prove that a ratio of greater inequality is diminished by adding the same quantity to both terms. Show that if $a : b :: c : d$ then $a : a + c :: a + b : a + b + c + d$.

(*Women only.*) Describe the most suitable furniture for a cottage bedroom. In what ways have wall-papers proved injurious to health?

15. (*Men only.*) A hare is 72 of its leaps before a greyhound and takes 9 leaps to his 5, but 3 of the greyhound's leaps are equal to 7 of the hare's. How many leaps will the hare make before it is caught? Ans. 243 leaps.

(*Women only.*) Which do you consider the best way of lighting rooms? Give your reasons, and state what you think to be drawbacks to the use of oil-lamps, of gas, and of candles.

16. (*Men only.*) The height of a cylindrical vessel is equal to half the radius of the base, and the vessel holds a gallon. Find the radius. Ans. 5·61 inches.

17. (*Men only.*) Write out Euclid III. 32.
Two circles touch externally at A, and the tangent at B to one of them cuts the other in C and D. Show that BC and BD subtend supplementary angles at A.

(*Women only.*) Give a short description of the different machines for the saving of labour which are used in a well ordered laundry.

18. (*Men only.*) Write out Euclid I. 32.
Prove also the corollaries, and calculate the interior angle of a figure with an infinite number of sides.

Third Week.

1. Write in Large-hand the words '*Kimberley Diamonds.*'
Write in Small-hand the lines :—
'*Hark! the convent bells are ringing,*
And the nuns are sweetly singing.'

2. Write from Dictation :—
'He showed that the planetary orbits must be elliptical, that the lunar irregularities, the precession of the equinoxes, and the phenomena of the tides, must take place from the principle and law of universal attraction, thereby evincing, in the strongest manner, that he had arrived at the knowledge of those laws which uphold the system of the world.'

3. At what point in your teaching of arithmetic would you introduce '*rules*' and require them to be learned? Give a sketch of a model lesson on '*Division by Factors*,' showing when and how you would teach the rule for that operation.

4. The Code directs that the earliest lessons in history for young children should be anecdotal and biographical. Give reasons for this recommendation, and mention a few leading incidents in English History which you think might be usefully narrated to learners before their regular chronological study of history begins.

5. What are the ranges of Tenor and Bass voices respectively?

6. What do we mean by '*Vocal Registers*,' and the '*great break*' in the voice? Give a few rules as to *breathing* whilst singing.

7. Investigate and state approximately the proportion of Classical and Teutonic words found in 'Geraint and Enid,' *or* Book II., 'Paradise Lost.'

8. (*Men only.*) What are the grounds of Tennyson's claims to be considered a representative of his age?

(*Women only.*) What is the history of the inception, composition, and production of 'Paradise Lost'?

9. State briefly the causes and directions of the chief winds and chief ocean currents in the tropical and sub-tropical regions. Refer to any difference of opinion among scientists respecting the causes of currents.

10. What are the chief religions of Asia and by whom professed?

11. Give the chief events of the following years :—1215, 1314, 1415, 1513, 1715, and 1815.

12. (*Men only.*) Sketch the incidents of '*The most glorious year of the British Empire.*'

(*Women only.*) In what battles were British generals slain? Give particulars.

13. If A can do a piece of work in 6 days of 7 hours each, and B can do it in 4 days of 11 hours each, how many hours a day must A and B work together to get the whole done in 2 days?
Ans. $10\frac{2}{3}$ hrs.

14. (*Men only.*) If S_n denotes sum of n terms of a G.P. of which first term is a and common ratio r, find S_n, and show that it $= (1 + r)S_{n-1} - rS_{n-2}$ Ans. $S_n = \frac{a(1 - r^n)}{1 - r}$.

(*Women only.*) Describe as fully as you can the nature of the lungs, and the changes which the air undergoes in them. Show how the changes are promoted by exercise and retarded by sedentary occupations.

15. (*Men only.*) Find the H.M. between two given quantities.
If a, b, c, d are in H.P., show that as $ad : bc :: a + d : b + c$.

(*Women only.*) Describe some simple ways of ventilating rooms without creating draughts. How does a fire ventilate a room?

16. (*Men only.*) A square iron rod an inch thick weighs $10\frac{1}{2}$ lbs. Find the weight of a round iron rod of the same length and thickness. Ans. 8·2467 lbs.

17. (*Men only.*) Write out Euclid III. 34.
Through a given point outside a given circle draw a straight line which shall intercept a segment containing a given angle.

(*Women only.*) Explain clearly the value of pure air for health; the necessity of ventilation in a schoolroom; and describe any good system of ventilation for an Elementary School with which you are personally acquainted.

18. (*Men only.*) Write out Euclid III. 35.
Show the connection between Euclid II. 14 and this proposition.

SECOND YEAR.

First Week.

1. As in First Year.

2. As in First Year.

3. Write a short essay on the relative value of manual and intellectual training, and show how both ought to be kept in view in the management of a school.

4. What knowledge does Spencer think that a man ought to possess to fit himself for the discharge of his civic duties? OR
Pestalozzi maintained 'that love was only useful in the education of men when in conjunction with fear.' How can a teacher gain both the *love* and *fear* of his scholars, and utilise the *respect* thus secured for their advancement?

5. Fill up three bars in $\frac{3}{4}$-time, introducing syncopation at least once in each bar, OR
Fill up two measures in each of the following kinds; show at least one rest and one divided pulse in each measures; use 'D' throughout :—Six-pulse, three-pulse, four-pulse.

6. As in First Year.

7. Assign to Tennyson *or* Shakespeare his place in English literature. What do you think the finest of his works? Give reasons.

8. (*Men only.*) As in First Year.

(*Women only.*) Explain and derive :—Inbarred, pensileness, peremptory, untaxed, humanity, and consociateth.

9. (*Men only.*) As in First Year.

(*Women only*). Give particulars respecting the climate of Australia and New Zealand.

10. (*Men only.*) As in First Year.

(*Women only.*) Where and what are Awe, Cupar, John O'Groats, Dunedin, the Bass Rock, Tantallon, and Carron.

11. (*Men only.*) As in First Year.

(*Women only.*) For what events are the following years noted —1497, 1542, 1547, 1568, 1587, and 1598?

12. (*Men only.*) As in First Year.

(*Women only.*) Trace the rise of the Puritans, and enunciate their main political and religious opinions.

13. (*Men only.*) If a pipe the diameter of which is ·3 inches fill a cistern in 100 hours, in what time will a pipe the diameter of which is ·3 fill it? Ans. 81 hours.

(*Women only.*) Express the square root of 160 acres as the decimal of a mile, long measure. Ans. ·5.

14. As in First Year.

15. (*Men only.*) As in First Year.

(*Women only.*) Cut out in paper half the front and half the back of the upper part of a woman's night-dress. Darn a hole, in the common method, on stocking material.

16. (*Men only.*) A prismoidal tub has a rectangular base 2 ft. by 1 ft., and a top 2 ft. 9 ins. by 1 ft. 9 in., and is 18 in. deep. Find how much water it contains, having given that a cubit foot of water weighs 1,000 ozs., and a gallon weighs 10 lbs? Ans. 31·06 galls.

(*Women only.*) Explain the meaning of each of the terms—*premium, policy, claim,* as used in connection with Life Insurance?

17. (*Men only.*) Assuming the law of formation of the terms to hold when $n-1$ binominal factors are multiplied together, prove it to hold for n factors, and hence derive the Binominal Theorem.

(*Women only.*) '*Those that with haste will make a mighty fire*
Begin it with weak straws.'

Is this the best way to make a fire? Give some rules, suited for a class of elder girls, as to making a fire; and also as to the best way of economising fuel in those times of the day when the fire is least needed.

18. (*Men only.*) As in First Year.

(*Women only.*) The area of an oblong field, whose length is twice its breadth, is 80 acres. Find the length of its sides?

Ans. 440 yards, 880 yards.

19. (*Men only.*) Write out Euclid VI. 12.

Through a given point between two given straight lines draw a straight line which shall be terminated by the given lines and divided by the point in a given ratio.

THIRD WEEK.

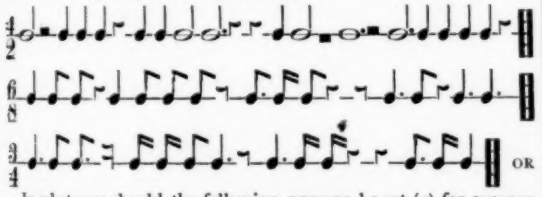
1. As in First Year.

2. As in First Year.

3. Describe the best method you know of keeping the air of a schoolroom fresh and pure, and of maintaining a uniform temperature throughout the day.

4. Explain, and illustrate by examples, the use of the terms—*Ambiguity, Convertible, Hypothesis,* and *Inference.*

5. Bar the following passages in accordance with the time-signatures. Each passage commences a bar.



In what way should the following passage be set (*a*) for average young trebles, and (*b*) for average young altos—

d s, l, s, f, m, s, l, m r t, d?

6. As in First Year.

7. (*Men only.*) As in First Year.

(*Women only.*) Paraphrase lines 58 to 69 of Hamlet, Act IV., Scene 4.

8. (*Men only.*) As in First Year.

(*Women only.*) Write a brief essay on 'Wisdom is justified of her children.'

9. (*Men only.*) As in First Year.

(*Women only.*) Describe as fully as you can the interior of Australia.

10. (*Men only.*) As in First Year.

(*Women only.*) Draw a physical map of New Zealand.

11. (*Men only.*) As in First Year.

(*Women only.*) What events are connected with the names of Cabot, Empson, Campeggio, Joan Boucher, Sir T. Wyatt, Earl of Tyrone?

12. (*Men only.*) As in First Year.

(*Women only.*) Give the dates of establishment of Court of Star Chamber, Court of High Commission, Lords-Lieutenant of Counties, and of the East India Company. What do you know of the first two?

13. Find the value of $\frac{\cdot461538 \times 29\cdot25}{65\cdot52 \times \cdot142857}$ of 2 cwt. 1 qr. 8 lb.

Ans. 3 cwt. 1 qr. 11 lb.

14. As in First Year.

15. (*Men only*). As in First Year.

(*Women only.*) Cut out on paper half the front and half the back of the upper part of a boy's shirt, show on calico square sewing and felling.

16. (*Men only.*) Compare the volume of a sphere which touches the six faces of a cube, with that of the sphere passing through the angular points of the cube. Ans. As $1 : 3\sqrt{3}$.

(*Women only.*) By accepting A's offer for land recently purchased, I should lose 7 per cent. on the purchase money. By accepting B's offer I should gain 5 per cent. B offers £273 12s. 0d. more than A. Find what I paid for the land. Ans. £2,280.

17. (*Men only.*) If $a : b :: b : c :: c : d$ show that

$$\left(\frac{a-b}{c}+\frac{a-c}{b}\right)^2-\left(\frac{d-b}{c}+\frac{d-c}{b}\right)^2=(a-d)^2\left(\frac{1}{c^2}-\frac{1}{b^2}\right)$$

(*Women only.*) What is meant by *Stock* for cooking purposes? Say how you would use and economise it. Give recipes for two cheap, nourishing soups.

18. (*Men only.*) As in First Year.

(*Women only.*) Find the Compound Interest on £2,666 13s. 4d. for 4 years at 2½ per cent. Ans. £276 16s. 8¾d.

19. (*Men only.*) Write out Euclid VI. 14.

Describe a rhombus equal to a given rectilineal figure and having an angle equal to a given angle.

CORRESPONDENCE.

We shall be pleased to reply briefly through these columns to any SUBSCRIBER *seeking examinational information or advice, and* ENCLOSING THE NECESSARY COUPON.

This privilege does not, of course, extend to furnishing the solutions and answers of problems. All such communications should be addressed to 'THE QUERY EDITOR.'

Replies demanding urgency will be promptly forwarded per post on the receipt of a stamped and addressed envelope, ACCOMPANIED BY THE REQUISITE COUPON.

A post will be saved by writing direct to DR. GEORGE BEACH, M.A., (*Examination Editor of* '*Practical Teacher*'), STANLEY MOUNT, MACCLESFIELD.

PROOF (Leighton Buzzard), We will give them next month.

S.A. (Hyde), There are many exceptions to the general rule as to the obligation to give a stamped receipt. Certain receipts for salaries are exempted, and refer to money received by officers of Public Departments of the State. I cannot discover any other exceptions.

M.A.P. (Shelton), 'Quick's Educational Reformers' is now published by Longmans.

H.R.N. (Merthyr), Political Economy could not be taken as an extra.

B.C.G. (West Bromwich), We will endeavour to meet your wishes next month.

S.T. (Winchester), Apply to Postmaster-General.

M.J. (East Finchley), You require to study the subjective and objective Genitive, cf.—

'That sweet aspect of princes and *their* ruin.'

E.H.C. (East Dereham), (1) Notes of lessons are prepared for *both* objects; (2) Yes, for the subjects named, but for different classes; (3) Try '*Practical Teacher*' or '*Schoolmaster*' columns. They are a drug on the market.

XMAS (Bangor), 95 per cent. Dispense with the flourishes.

H.M. (New Tredegar), We wrote, but our letter was returned from D.L.O.

S.S.T. (Stafford), 'La Jeune Sibérienne' will not be again inserted. It is published, with translation and notes, by Hughes and Co., 2s.

—— (———), Potts' Euclid will meet requirements.

W.H.T.P. (Southsea), Many thanks for your solution, which is embodied in Article.

R.N. (Smethwick); TOM (Stoke); W.R.N. (Bodmin).

E.F.G. (Coventry), Many thanks. The answer to No. 2 sum, p. 127 (First Year), should be $\frac{3258}{8333}$.

LETTERS ANSWERED PER POST.—W.V. (Croft St.); P.M.P. (Garn Brea); M.R. (Stoke); T.B.S. (Ulverston); H.G. (Golden Hill); G.P. (Bewdley); H.W.B. (Alnwick); E.O.M. (Cannock); S.A. (New Brighton); MARE (———); W.W.W. (Crewe); J.W. (Dinas); A.B. (Hucknall Torkard); A.M.C. (Barrow-on-Soar); C.C.D. (Barnsley); E.B. (Alresford); L.H. (Dewsbury); R.T. (Uttoxeter); E.B. (Caulden Lowe); M.M. (Totton); F.R. (Macclesfield); F.W.M. (Holyhead); J.W. (Rowley); M.H. (Beverley); O.H. (Burbage); W.H.V.R. (Carrville); J.A.R. (Chester-le-Street); E.P.B. (South Ockendon); B.C. (Wavertree); S.A.S. (Rounds Green); E.A. (Old Goole); B.G. (North Shields); A.L.E. (Surbiton Hill); R.R. (West Bromwich); W.A. (Portland); T.S. (Chester); W.C.J. (Kidsgrove); J.T.C. (Durham); E.C. (Edgbaston; B.S. (Kirkcaldy); G.B. (Paisley).

CERTIFICATE ROUTINE FOR OCTOBER 1893 (MEN AND WOMEN, FIRST YEAR).

DAYS	FIRST WEEK.			SECOND WEEK.			THIRD WEEK.			FOURTH WEEK.		
	I.	II.	III.	I.	II.	III.	I.	II.	III.	I.	II.	III.
MONDAY	Training of the Ear	Read 'Trench,' Lecture IV., *or* Johnson's 'Milton,' pp. 108 to 123 (Notes)	Euclid, Book III., Props. 1 to 19. *or* Repairing Underclothing	General Principles of Teaching	Study Notes of 'Geraint and Enid,' pp. 100 to 110, *or* Johnson's 'Milton,' pp. 1 to 25	Euclid, Book III., Props. 19 to 37, *or* Diagram of an Infant's Shirt	Cultivation of the Intelligence	Analyse lines 245 to 253, and Parse difficult words, of 'Geraint and Enid.' *or* Study Notes on Lines 560 to 574 of 'Paradise Lost,' Book I.	Euclid, Book I., Props. 1 to 26, *or* Any Needlework	Training of the Voice	Study Notes of 'Gareth and Lynette,' pp. 91 to 104, *or* Johnson's 'Milton,' pp. 25 to 50	Euclid, Book II., *or* Organs of Respiration
TUESDAY	Chief Dates from 1509 to 1585	Problems involving Simple Equations *or* Construction of the House	Shape, size, and motions of Earth	Chief Dates from 1585 to 1639	Stocks *or* Compound Interest	Geography of Turkey in Asia	History from 1727 to 1760 *or* Revision	Evolution of Algebra *or* Cleanliness of the Home	Physical Geography of Hindostan	Chief Dates from 1639 to 1665	Equation of Payments *or* Stocks	Mental Arithmetic
WEDNESDAY	Compound Interest	Mensuration *or* Any Revision	Sequence of Intellectual Development	Exchange *or* Theory of Proportion	Simultaneous Equations of one Degree *or* Warming the House	Mensuration *or* Grammar from Text-book	Stocks *or* Compound Proportion	Simultaneous Quadratics *or* Composition of Air	Euclid, Book I., Props. 27 to 48, *or* Cutting-out of an Infant's Shirt	Averages	Problems involving Simultaneous Equations of one Degree *or* Ventilation	Political Geography of Hindostan
THURSDAY	History from 1377 to 1461	Problems involving Quadratic Equations *or* Furnishing of the House	Map of China	History from 1455 to 1509	Involution of Algebra *or* Lighting the House	Geography of Beloochistan and Afghanistan	Tables of the Tudor, Stuart, and Hanoverian Dynasties	Present Worth *or* Simple Proportion	Map of Hindostan	History from 1509 to 1568	Mixtures *or* Theory of Interest	The Atmosphere, rain, clouds, and vapour
FRIDAY	Repetition, Penmanship, etc.	Deductions of Euclid, Book I., *or* Diagram of an Infant's Shirt	Analyse Lines 436 to 445 of 'Geraint and Enid' *or* Lines 134 to 142 of 'Paradise Lost,' Book I., Parse difficult Words	Constitutional Changes and Literature of the Period *or* Chief English Poets	Deductions of Euclid, Book II., *or* Cutting-out of an Infant's Shirt	Analyse lines 641 to 649 of 'Gareth and Lynette' *or* Lines 430 to 441 of 'Paradise Lost,' Book II., Parse difficult Words	Any Revision of School Management	Deductions on Euclid, Book III., 23 to 37, *or* Any Needlework	Read 'Trench,' Lecture V., *or* 'Paradise Lost, pp. 1 to 12, Book I.	Simultaneous Quadratic Problems *or* Respiration	Deductions on Euclid, Book III., *or* Questions on Needlework	Write a short essay on 'Rates and Taxes'
SATURDAY	Notes of a Writing Lesson to Standard II.	Music—Value of Notes and Rests *or* Pulses and Accents	Examination	How to teach Spelling	Music—Signatures of the *Simple* Times *or* Two, Three, and Four Pulse Measures	Examination	Repetition, Penmanship, etc.	Music—Accent and contents of Bars, *or* Continuations, Rests, etc.	Examination	Sequence of Intellectual Development	Music—Transcription from one time to another	Examination

CERTIFICATE ROUTINE FOR OCTOBER 1893 (MEN AND WOMEN, SECOND YEAR).

CERTIFICATE ROUTINE FOR OCTOBER 1893 (MEN AND WOMEN, SECOND YEAR).

DAYS	FIRST WEEK.			SECOND WEEK.			THIRD WEEK.			FOURTH WEEK.		
	I.	II.	III.	I.	II.	III.	I.	II.	III.	I.	II.	III.
MONDAY	The Summary Register and how to keep it	Analyse (and Parse difficult words of) Lines 436 to 445 of 'Geraint and Enid' *or* Lines 1 to 14 of Scene 2, Act I., of 'Hamlet'	Euclid, Definitions of Book V., *or* Print Patch	School Premises.—Warming, Colouring, Lighting	Paraphrase Lines 194 to 204 of 'Gareth and Lynette' *or* Lines 11 to 24 of Scene 3, Act I., of 'Hamlet'	Deductions upon Euclid, Book IV., *or* Diagram of a Boy's Shirt	Notes of a Dictation Lesson to Standard VI.	Study 'Macbeth' *or* 'Hamlet'	Euclid, Book IV., *or* Linen Patch	Organisation of Mixed School of 200 average	Study 'Gareth and Lynette' *or* 'Advancement of Learning,' pp. 129 to 144 (Notes)	Permutations and Combinations *or* Expenses of Clothing
TUESDAY	As in First Year *or* History from 1485 to 1509	Insurance	As in First Year *or* Physical Geography of Scotland	As in First Year *or* History from 1509 to 1547	Stocks	As in First Year *or* Physical Geography of Ireland	As in First Year *or* Dates from 1547 to 1603	Discount	As in First Year *or* Political Geography of Ireland	As in First Year *or* History from 1547 to 1603	Jevons' Logic *or* Definitions of Arithmetical Terms	As in First Year *or* Physical Geography of New Zealand
WEDNESDAY	Repetition, Penmanship, etc.	Binomial Theorem *or* Choice of Food	The Process of Reasoning (Jevons' Logic)	Binomial Theorem *or* How to spend a limited weekly income	Repetition, Penmanship, etc.	Contents of Acts I. and II. of 'Macbeth' *or* 'Hamlet'	Logarithms *or* Investments	Stocks	Contents of Acts III. and IV. of 'Macbeth' *or* 'Hamlet'	'Herbert Spencer,' pp. 49 to 71, *or* 'Quick,' Chapter XVIII.	Ratio and Proportion *or* Investments	Mensuration *or* Geography
THURSDAY	As in First Year *or* Dates from 1485 to 1547	Stocks	As in First Year *or* Map of New Zealand	As in First Year *or* History from 1547 to 1580	Race Problems *or* Notes of a Lesson on 'The Chemistry of Cooking' and 'Neatness in Dress'	As in First Year *or* Political Geography of Scotland	As in First Year *or* Revise the Literature of the Period	Miscellaneous Arithmetical Problems *or* Notes on 'Hamlet'	As in First Year *or* Map of Southern half of Australia	As in First Year *or* Industrial Conditions from 1525 to 1601	Compound Interest	As in First Year *or* Political Geography of New Zealand
FRIDAY	Binomial Theorem *or* Beverages for Sick	Euclid, Book VI., Props. 1, 2, 3, *or* Diagram of a Boy's Shirt	Study 'Trench,' Lecture V., *or* 'Advancement of Learning,' pp. 114 to 129 (Notes)	Logarithms *or* Cooking ordinary flesh meat	Definitions of Euclid, Book VI., Props. A, 4, 5, 6, *or* Cutting out in Paper a Boy's Shirt	Analyse (and Parse difficult words of) Lines 1 to 12 of 'Macbeth,' Act I., Scene 7, *or* Lines 215 to 126 of Scene 3, Act I., of 'Hamlet'	Logarithms *or* Duties of a Housemaid	Deductions upon Euclid, Book III., *or* Diagram of a Child's Muslin Pinafore	Paraphrase Lines 35 to 46 of Act II., Scene 2, of 'Macbeth' *or* Lines 95 to 106 of Act I., Scene 5, of 'Hamlet'	Surds *or* Economy of Food	Euclid, Book VI., Props. 7 to 11, *or* Diagram of a Child's Muslin Pinafore	Study 'Geraint and Enid' *or* 'Hamlet'
SATURDAY	Formation of Habits and Character	Music—Value of Notes and Rests *or* All the Measures in common use	Examination	Health of Scholars and Teachers	Music—Signatures of the Compound Times *or* Division of Pulses into thirds and quarters	Examination	'Herbert Spencer,' pp. 23 to 49, *or* 'Quick,' Chap. XVIII.	Music—Accent, Syncopation, and Contents of Bars and Measures	Examination	The Admission Register and how to keep it	Music—Transcription from one Time to Another	Examination

BOOKS FOR LONDON INTERMEDIATE SCIENCE AND PRELIMINARY SCIENTIFIC.

Mathematics.

Euclid :—The Harper Euclid (4s. 6d.) ; Books VI. & XI. 2s.
Mensuration and Properties of the Sphere : Wilson's Solid Geometry (Macmillan, 3s. 6d.), Sections II., III., & IV.
Co-ordinate Geometry :—Briggs & Bryans'.—The Right Line and Circle (Tutorial Series, 2s.).
Trigonometry :—Levett & Davison's Plane Trigonometry, Part I. (Macmillan, 3s. 6d.).
Algebra :—Hall & Knight's Higher Algebra (Macmillan, 7s. 6d.) ; *or*
A Treatise on Algebra : Charles Smith (Macmillan, 7s. 6d.).
Arithmetic :—Brook Smith's (Macmillan, 4s. 6d.) ; *or*
Pendlebury (Macmillan, 4s. 6d.).

Mixed Mathematics.

Dynamics for Beginners : Lock (Macmillan, 4s. 6d.).
Statics for Beginners : Lock (Macmillan, 4s. 6d.) ; *or*
Loney's Statics and Dynamics for Beginners, 7s. 6d.

Biology—Zoology.

Marshall & Hurst's Practical Zoology (Smith & Elder, 10s. 6d.).
The Frog : Marshall (Smith & Elder, 4s.).
Text Book of Biology, Part I. : Vertebrates (Tutorial Series, 6s. 6d.).
" " Part II. (In Preparation).

Botany.

Prantl & Vines' Text Book of Biology (Sonnenschein, 9s.).
Elementary Botany : Oliver (Blackie, 2s.). (Hardly full enough.)
Strasburger & Hillhouse's Practical Botany (Sonnenschein, 9s.) ; *or*
Bower's Practical Botany (Macmillan, 10s. 6d.).

Chemistry.

Theoretical.—Watt's Inorganic Chemistry : Tilden (Churchill, 8s. 6d.) : *or*
Jago's Advanced Inorganic Chemistry (Longman, 4s. 6d.) ; *or*,
Thorpe's Manual of Inorganic Chemistry (Collins, 2 vols., 3s. each).
Practical.—Tilden's Analysis, 1s. 6d. ; *or*
Sexton's Qualitative Analysis (Griffin, 3s. 6d.).

Physics.

Text Book of Heat : R. W. Stewart (Tutorial Series, 3s. 6d.).
Text Book of Light : R. W. Stewart (Tutorial Series, 3s. 6d.).
Text Book of Electricity and Magnetism : R. W. Stewart (Tutorial Series, 5s. 6d.).
Text Book of Sound : R. W. Stewart. (In Preparation) ; *or*
Text Book of Sound : Stone (Macmillan, 3s. 6d.) : *or*
Deschanel's Natural Philosophy, Part IV. (Blackie, 4s. 6d.) : *or*
Tyndall's Sound (Longmans, 10s. 6d.).
Glazebrook and Shaw's Practical Physics (Text Books of Science. Longmans, 6s.).
Magnus' Hydrostatics, with Answers (Longmans, 2s.).

Students of the London Course are requested to preserve this list in order to save both themselves and the Editor trouble.

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NEEDLEWORK—CUTTING-OUT.

Education Department, Whitehall, London, S.W.

SIR,—My Lords have received from several quarters representations as to the difficulty of carrying out the requirements introduced into Schedule 3 of the Code for 1893, that garments made by girls in Standards V. and VI. should be cut out by their makers.

My Lords consider that systematic instruction in cutting-out is a most important part of every satisfactory scheme for teaching Needlework in Elementary Schools, and they are not prepared to alter the present rules, the object of which is that children in Standard IV. and upwards should by easy steps learn how to cut out garments of simple construction.

But while declining to alter the Schedule in this particular, their Lordships are anxious not to make any undue demands on teachers or children who may be unable without longer preparation to satisfy the demands of the Code.

I am, therefore, to request that in administering the Code of 1893 you will be careful not to insist too strictly on the exact fulfilment of the requirements of Schedule III. as to cutting-out. You should, however, satisfy yourself that graduated instruction in cutting-out has been given to all girls in and above Standard IV.

I am to add that in order to give more time and opportunity for cutting-out, my Lords are considering whether it will not be possible in the Code of 1894 to modify the requirements of Schedule III. in certain other directions.

I have the honour to be, Sir, your obedient Servant,

To H.M. Inspector of Schools. G. W. KEKEWICH.

WELL-KNOWN TEACHERS AT WORK.

MR. W. T. THOMPSON, B.A. (HONS.).

Head Master Noel Park Board School, Tottenham, N.

AN intercourse extending over seven years with the 'victim' of the present sketch has left no room for doubt in your interviewer's mind as to the claim of Mr. Thompson for inclusion within the charmed circle of the elect amongst well-known teachers. It was, therefore, with no heart-searchings as to the utility of the 'talk' that we sought the subject of it.

A glance at Mr. Thompson is sufficient to prove him to be not unaccustomed to deliberation; and, in point of fact, carefully thought out methods are the order of the day at Noel Park.

As a P.T., our host informs us, he served at the National School, Hatcham, the Rev. Arthur Tooth, of ritualistic memory, being the vicar. Of this gentleman's sympathy with the budding pedagogue Mr. Thompson speaks in terms of high praise. At the Scholarship Exam. Mr. W. T. Thompson showed that his intellectual endowments put him considerably in advance of the 'ruck,' for he was eighth on the Scholarship List of Church of England candidates. St. Mark's College, Chelsea, was the institution which Mr. Thompson chose as his Alma Mater *in prospectu*, and here he was Senior Student in 1871 and 1872. We next asked for particulars of Mr. Thompson's degree, which we already knew to be not of the genus 'poll,' for, by virtue of his excellence in matters academical, Mr. Thompson was, we remember, put forward as a 'teacher's candidate for Convocation of London University'—a position which he would have adorned. 'At my Matriculation Exam.,' responded the catechised, 'I was placed seventh in honours, number six being the unfortunate chaplain of the ill-starred Victoria. I was second in French Honours, with the number of marks qualifying for the prize, at the Intermediate Arts Exam., and was again second in French Honours and fifth in German Honours when the whirligig of time brought round my final B.A. Exam. It may be interesting to note that at these two latter Exams. I chummed with the great novelist Zangwill, who was next below me in French Honours at both intermedial and final B.A., and a most companionable man I found him.' At that period he was an assistant master in the Jews' Free School. We remark that Mr. Thompson's academic success was such as to leave no room for either St. Mark's College or London University to be ashamed of their student.

Continuing, Mr. Thompson said, 'From college I proceeded to the Head-Mastership of a Church school at Brighton, where I remained for a year, returning, at the end of that period, to London as Senior Assistant Master of the Bishopsgate Upper Grade Boys' School, where I remained until 1876, in which year I was appointed second master of the Westmoreland Road Board School, Newcastle-on-Tyne—a large mixed school with an accommodation of over 600. In December 1877 I was appointed Head Master of the Bowling Back Lane Board School, Bradford, a school of special difficulty, both from its situation in one of the roughest quarters of the town, and from the fact that about 40 per cent. of the scholars were factory half-timers.' Mr.

Thompson's reports show how complete was his success in this difficult sphere of labour.

'In February 1884,' continued our host, 'I hied myself once more towards the City of Fog, to take up the post of Head Master of Page Green Board School, Tottenham, succeeding Mr. A. H. Sadd, who became Inspector's Assistant to Mr. Danby. Five years later, at my own request, my Board transferred me to my present school, which, although accommodating 625 boys, is already more than full.'

After a walk round the school, which is excellently adapted for its purpose, we can understand that any teacher should desire to work amid such congenial surroundings. The rooms, with the exception of two for forty each, accommodate sixty scholars, and are so planned that the Master can readily command the whole of his class. Glazed tiles add a beauty and an ever-clean appearance to the walls, which are literally crowded with beautiful maps and charts in orderly and useful arrangement. In the hall, or widened corridor into which the majority of the rooms open, are some splendid specimens of the Art for Schools' Association's productions, so that to look up here is an education of the aesthetic faculty. A small room has been fitted up with pigeon-holes for stock-storing, &c., to lighten the labour of the school-keeper, and a lift works from the ground to the upper floors. Of course there is a museum, and excellent are the useful specimens which it contains, all being contributed by scholars, ex-scholars, and friends, of whom the school rejoices in many. Coins, fossils, minerals, and natural history specimens are present in abundance, and much profit is obtained from this feature, especially in connection with the science work. All this we learn from Mr. Thompson whilst inspecting the specimens; in addition we learn that the School Library contains about 600 volumes, no unworthy monument to the success of the School Entertainments, of which the library is the direct outcome. That £23 should have been taken in shillings and sixpences at one of their gatherings does not surprise us, as evidence of Mr. Thompson's earnestness, wisdom, and popularity present themselves. Nor are we surprised to know that in this admirable school physical education is looked upon as of vital importance. Indeed, the school holds the cups for football and cricket offered for competition to the Board Schools of Tottenham.

Yours faithfully
W. J. Thompson

This year of grace is the second year of the cricket cup competition, and our young Graces have, so far, won every match and made their position impregnable, for, should they lose every match yet pending, they would still be the Tottenham Cup-holders. To whom is ascribed the credit for this happy state of affairs? is our next query. The reply was not altogether unexpected: 'My Assistant-Masters have devoted a considerable amount of their time to instructing the boys and to playing with them. Promising colts are discovered by inter-standard matches, which are continually in progress during the season. Another fixture is a match between staff and school, and to the credit of the youngsters of '93 be it said that the staff had to lower their colours at the last match.' Yet another incident was mentioned which plainly shows the effect of sports on character, and as Mr. Thompson is with Thring in believing firmly that 'education is character and not cram,' he dwells upon this incident with pardonable satisfaction. The best player was not the most popular boy, and the rank and file proceeded to elect an inferior player as captain. The Master pointed out that personal feeling must be ignored; the captain should be the boy most likely to do the greatest service to the team in this capacity. Whereupon the boys reconsidered their choice, with the result that the less popular boy (who perhaps had learnt his lesson) was chosen by the rank and file, who certainly had made some progress in the desirable art of 'sinking self.'

Mr. Thompson next drew our attention to that excellent institution the School Magazine, wherein we find, to our infinite satisfaction, a 'roll of honour' containing no less than 264 boys who have neither been absent nor late during the past four weeks. 'What is your percentage of attendance?' we were impelled by this imposing array to ask. 'On the average it is about 91 per cent.; but in the higher classes it goes up as high as 95 per cent.' 'What an excellent Attendance Officer you must possess!' was our ejaculation, which was met by the following interesting retort: 'Very rarely do I find it necessary to ask that functionary to visit cases of bad attendance. My aim is to obtain influence over scholars and parents by interesting them in *their* school. Besides this, I am vigorously supported by my Board and by the magistrates in dealing with contumacious parents. Good attendance, which I

regard as the basis of all good school-work, is further secured by the use of a Weekly Attendance Card indicating how often children have been at school during the week, and if punctual. This card has to be signed by the parents.' 'Your devices,' we observe, 'then are threefold—(1) interest, (2) weekly cards, and (3) roll of honour; to which of these, Mr. Thompson, would you yield premier position?' 'To the last, without doubt,' was the emphatic reply, and we are bound to say that we were quite convinced of the wisdom of using 'the roll.' 'I forgot to add,' remarked our friend, 'that participation in the School Library is restricted to regular children, and to cut a boy off from 600 of the most popular boys' novels and stories is, in many cases, most acutely felt.'

An interesting confab on 'school methods' followed thereupon, in the course of which we learn that Mr. Thompson is a firm believer in the dictum that 'genius consists in an infinite capacity for taking pains,' and acts accordingly. 'Reading is taught,' says he, 'mainly on the Phonic method, and very great and painstaking attention is paid to this subject by my Assistants. Proper pronunciation and enunciation are rigidly attended to from Standard I. upwards. We also make a great point of emphasis. In the lower standards we take particular care to lead the children to see what are the emphatic words in a passage, and to understand why those words, and not others, should be emphasised.

'The Civil Service style of writing is affected by Noel Park, and from Standard I. upwards paper work is required.

'As to Arithmetic, we aim at simplification and at dealing with concrete examples, at the same time discarding all methods which simply obscure the end aimed at, or which form continual pitfalls for the unwary. For this reason we superseded, some years ago, the traditional way of working multiplication of compound quantities by factors, and substituted the simpler and surer method of multiplying by the whole number in one operation. Classes above Standard II. are taught extended multiplication and pence tables, and the upper classes acquire a knowledge of the squares and cubes of simple numbers.

'Chemistry is taught as a class subject in Standards V. to VII., Grammar being taken from I. to IV., and a scheme combining Geography with History is followed throughout the school.

'My specific subjects are Algebra and Shorthand, and Standard VII. and ex-Standard VII. scholars are prepared for the Science and Art Department's Examinations in Mathematics, Acoustics, Light and Heat, and Physiography. The success of my school is due in great measure to the wise liberality of my Board in providing excellent buildings and in equipping their schools with an efficient and sufficient staff, provided with plenty of good apparatus and materials.'

'With your permission, Mr. Thompson, I should like to have a few facts about your connection with N.U.T., of which body I believe you are an ardent and eminent member.'

'I plead guilty to being ardent; but you are greatly at fault in speaking of me as eminent in any except a Sloperian sense,' was the ready response to my harmless rally. However, the particulars came, and here they are.

'I have been a member of the N.U.T. for over twenty years, and have been successively Secretary of the Bradford Association—the membership of which doubled during my first year of office—President of the same Association, and, upon my removal to London, I was elected by the West Yorks District Union as their representative on the Executive of the N.U.T. After holding this post for two years I had the honour, in 1886, of becoming an elected member of the Executive, but in 1888 press of business compelled me to reluctantly resign. I have been President of the North Middlesex and of the North London Suburban Associations—the latter I had the privilege of helping to found. Of the Orphanage and Orphan Funds I am a Life Governor, and am a Life Member of the Benevolent Fund. As Secretary of the Bradford Association I took a leading part in securing the election of first representative of Half-Time Schools on the Executive. It fell out on this wise. We requested all the Associations in the factory districts of Lancashire and Yorkshire to send delegates to a meeting in Manchester, and a result of this meeting, at which I acted as one of the two Bradford representatives, was the selection and subsequent election of Mr. W. Bagot as a member of the Executive with a watching brief for the Half-Time Schools. Furthermore, from this meeting at Manchester sprang the Half-Time Council, whose influence I am pleased to see becoming so great. The forward policy of the Executive has my hearty

commendation, and I am especially pleased with the adroit way in which that shameful evil, the insecurity of tenure, is being brought to a head.'

'What are your views as to the Inspectorate,' we next ask.

'I would make it a *sine quâ non* that all candidates for the Inspectorate should be experts both in the science and in the art of teaching, and I think it a scandal that no teacher has ever been chosen, Cincinnatus-like, from the plough. The successful and cultured teacher should be the first person, as being best qualified, to fill the post of Inspector.'

With this we agree, and think that Mr. Thompson himself would worthily fill this situation, whether considered from the personal, the academical, or the professional point of view. Mr. Thompson added that, in his opinion, teachers should take a more forward part in the discussion of political and social problems than they now do. 'It is the working classes,' said he, 'who have most to gain by political and social reforms. Generally speaking, the teacher is looked up to by parents, and he would gain much by becoming better acquainted with the ideas and aspirations of the artisan class. His wider knowledge would be helpful in putting into more practical form any crude proposals which the latter might advance. In addition, working men are becoming members of School Boards in increased numbers, and my own experience is that such members are least likely of all to favour any retrogression in education.

'As to the social recognition of teachers, I am glad that we hear less talk of this nowadays, for no class of persons gets increased social recognition by clamouring for it, and I am apt to believe that social recognition is doled out pretty well in conformity with merit. If we get increased consideration in this respect to-day, it is because the average teacher is a much more cultured being than he formerly was, and, with increased improvement in this respect—of which I am pleased to see so many hopeful signs—will come the time when no man will dream of treating a pedagogue with contumely.'

'One question more, Mr. Thompson, and we will torture you no longer. What is your opinion concerning free schooling and examination by sample?'

'Of the former I cannot speak too highly. I was at first afraid that I should lose some of my pupils in consequence of it; but the fear was groundless, and it has practically made no difference whatever to my school. Examination by sample is an excellent institution, second only in utility to that wise abolition of the Show Day, of which I would fain think sample examination is the harbinger—leading to Intermittent Inspection and dissociation of all grants from examination results.'

Cordially thanking our 'victim,' we took our leave, having spent a by no means profitless time in perpetrating our 'talk,' an opinion which we hope will be shared by the practical readers of the 'PRACTICAL TEACHER' when they peruse these lines.

PAPERS FOR PUPIL TEACHERS.

BY JOHN ADAMS, M.A., B.SC., F.C.P., ETC.
Principal, Free Church Training College, Aberdeen.

EXAMPLES OF THE SOCRATIC METHOD.

THE following examples are all the results of actual teaching. No doubt they could be much improved, by a careful 'editing,' by omitting troublesome answers, and by improving some faulty questions. But what they might gain in finish they would more than lose in usefulness. There is nothing that can so well illustrate teaching as teaching itself.

From my notebooks I have selected examples mainly from the ordinary work of the schoolroom. It is not to be supposed that the lessons from which extracts are made were necessarily altogether worked on the Socratic method. The teacher's skill is seen in his selection of the portions of a subject that are suited to the Socratic or any other special method; but, in the meantime, our business is to give examples of the Socratic method in actual operation.

Take, first, a grammar lesson on that very difficult subject, the Incomplete Complex Sentence. The pupils are assumed to have been *told* repeatedly in previous lessons that every subject must have a verb and every verb a subject. The following lesson is to make them *know* this fact. For, as old David Stow used to tire his students by repeating: 'A thing is never given till it is taken; a fact is never taught till it is learnt.'

On the blackboard is written the sentence:

'JOHN, WHO BROKE THE WINDOW.'

Teacher. Now, what did John do?
Pupil (confidently). Broke the window.
T. Then what did *who* do?
P. Broke the window.
T. Were there two windows, then?
P. No, sir.
T. Then who broke it?
P. John.
T. And what did *who* do?
P. (doubtfully). It says '*who* broke the window.'
T. Did it take two to break the window?
P. No, sir.
T. Then which of them did the breaking?
(Pupils puzzled—no answer.)
T. How many people were there altogether?
P. (cautiously). *John* and *who*.
T. Now, which was bigger, *John* or *who?*
P. They're both the same.
T. Then there was only one person there?
P. Yes, sir.
T. And what was his name?
P. John.
T. And what did he do?
P. Broke the window.
T. Then would it not be enough to say 'John broke the window'?
P. Yes, sir.
T. Is that what it says on the blackboard?
P. No, sir; it says 'John, *who* broke the window.'
T. And *John* and *who* are the same person?
P. Yes, sir.
T. Then they'll both have the same right to the verb?
P. Yes, sir.
T. Which of them is nearer the verb?
P. *Who.*
T. What mark is between John and the verb?
P. A comma.
T. Now, if only one of the two can claim the verb, which has the better right to it?
P. Who.

T. And every noun and pronoun that is a subject must have a verb?
P. Yes, sir?
T. Then if *who* gets 'broke,' what verb is left for *John?*
P. None.
T. How many subjects are there here?
P. Two.
T. And how many verbs?
P. One.
T. And every subject must have a verb?
P. Yes, sir.
T. How many verbs do we need, then, besides 'broke'?
P. One.
T. Give me one.
(No answer.)
T. John (who broke a window) did something or was something. What would you do if you broke a window?
P. (promptly.) Run away, sir.
T. Finish it then. John, who broke a window——
P. Ran away.
T. Which are the two verbs now?
P. *Broke* and *ran.*
T. Which belongs specially to *who?*
P. Broke.
T. And to *John?*
P. Ran.

In arithmetic most of what are called Catch Questions are excellent material for this method. The diffidence which the method encourages, and which in some subjects is a disadvantage, is here the very thing the teacher wishes to cultivate.

Note the brisk off-hand answer with which the following begins.

T. A salmon weighs seven pounds and half its own weight, what is the weight of the salmon?
P. 10½ pounds.
T. Let's see. 10½ pounds is the whole weight of the salmon?
P. Yes, sir.
T. Then half its own weight will be 5¼?
P. Yes, sir.
T. Keep 5¼ in your minds. Now, the salmon was to weigh seven pounds *and* half its own weight. Now, seven pounds *and* half its own weight is the same thing as 7lbs. *and* 5¼lbs. Now, what is its weight?
P. 12¼ lbs.
T. But I thought you said its whole weight was 10½ lbs.
(Pupils puzzled—no answer.)
T. Suppose we cut the salmon into two parts of exactly the same weight, so that if we put a part into each pan of a pair of scales the parts will exactly balance each other, which of the parts will weigh half of the weight of the salmon?
P. Both of them.
T. Well, put away one. Now what was the salmon to weigh besides half its own weight?
P. 7 lbs.
T. And how much of the salmon have we left after we have put away half its own weight?
P. Just the other half.
T. So how much must this 'other half' weigh?
P. 7 lbs.
T. Then if this part weighs seven pounds, what will the part weigh that we put aside.
P. The same—7 lbs.
T. So if each half weighs 7 lbs., what will the whole weigh?
P. 14 lbs.

The following lesson is important in itself apart from its bearing on the Socratic method. It was given to an advanced (Ex. VI.) class.

T. Water expands ten per cent. in turning into ice: what per cent. will ice contract in turning back again into water?
P. 10 per cent.
T. We'll see. Suppose you invest £100, and at the end of the year you find you have £110. How much have you gained?
P. £10.
T. On how much?
P. On a hundred.
T. What per cent. is that—£10 in £100?
P. Ten per cent.
T. Now suppose you invest your £110, but this year things don't go so well, and at the end of it you have only £100, how much have you lost?
P. Nothing.
T. Quite true: but each year stands by itself. This year you started with £110 and ended with £100. How much did you lose?
P. £10.
T. On how much? (A little hesitation.)
How much did you begin the *second* year with?
P. On £110.
T. Then if you lost £10 on £110, would you lose more or less *at the same rate* on £100?
P. Less.
T. So you would lose less per cent. the second year than you gained per cent. the first year?
P. Yes, sir.
T. And yet you gained £10 the one year and lost the same £10 next year?
P. Yes, sir.
T. Then if the profit and loss remain unchanged, what is it that is different in the two years?
P. The £100 and the £110.
T. And these are the sums *on which* the profit or loss is made.

Then follows a short dialogue on the meaning of the absolute and the relative, the distinction between which lies at the root of so many difficulties in percentages.

The following lesson illustrates how this distinction may be treated in an ordinary 'intelligence' lesson following a reading lesson.

T. Is the breath hot or cold?
P. (confidently). Hot, sir.
T. I have seen boys blowing upon their soup at dinner-time. I don't think they ought to do it: but what do you think they do it for?
P. To cool the soup.
T. What cools the soup?
P. (hesitatingly). The breath.
T. But didn't you say the breath was hot?
P. Yes, sir.
T. But hot things can't cool anything, can they?
P. No, sir.
T. And the breath cools the hot soup?
P. Yes, sir.
T. So the breath can't be hot, then?
P. No, sir.
T. Well, I have sometimes seen cabmen standing at a street corner, and sometimes boys in the middle of a snow-fight, blowing away into their joined hands. What do you think they do that for?
P. To warm their hands.
T. What warms their hands?
P. (hesitatingly). Their breath.
T. But I thought you said the breath was not hot?
(Pupils puzzled—a hand held out.)
T. Well, what do you think?
P. Sometimes it's hot, and sometimes it's cold.
T. When is it hot, and when is it cold?
P. Hot in summer, and cold in winter.
T. And when do you see people breathing upon their hands to warm them—in summer?
P. No, sir, in winter.
T. But you said the breath was cold in winter.
(Pupils again puzzled.)
T. What sort of soup do careless boys blow upon? Kidney soup, or pea soup, or white soup, or what?
P. (confidently.) Any kind, sir, that's too hot to eat.
T. Then whether is this soup or a boy's hand in a snow-fight the warmer?
P. The soup.
T. Whether is the boy's breath or his hand the warmer?
P. The breath.
T. And whether is the breath (the same breath, at the same time, on the same snowy day) or the soup the warmer?
P. The soup.
T. So the breath is warmer than the boy's hands, and colder than the soup?
P. Yes, sir.
T. And it is the same breath all the time?
P. Yes, sir.
T. Then it is both hot and cold?
P. Ye—yes.
T. If you were the soup, what would you call the breath, hot or cold?
P. Cold.

T. And if you were the boy's hands?
P. Hot.
T. And if you were a snow-ball, what would you call it?
P. Hot.
T. And if you were the stove over there?
P. Cold.
T. So breath is hot for some things and cold for others, and that's all we can say, isn't it—unless we know what we are speaking about along with breath?
P. Yes, sir.
T. And yet the breath itself is always the same?
P. Yes, sir.

The young teacher going over these lessons should pay particular attention to the places where the teacher is really *telling* the pupils something without seeming to do it, and it is a capital exercise to try to determine whether the thing really told could have been in any way educed.

It must be noted, however, that sometimes things are told merely to save time: *e.g.*, the teacher's remark after the answer 'Nothing,' in the third example, might have been thrown into the form of two questions, but with no advantage to the train of reasoning. On the other hand, 'Then half its own weight will be $5\frac{1}{4}$?' would be better in the form, 'Then what would half its own weight be?' since this would imply a slight exercise of independent thought, not a mere assent.

The former expression is quite Socratic, however.

LEGAL AND CODE QUERIES COLUMN.

RULES.

1. All communications must be addressed 'Legal Editor, PRACTICAL TEACHER, 5, Pilgrim Street, Ludgate Hill, E.C.,' and must be accompanied by our 'coupon,' duly filled up.
2. Replies will be given *only* in this column, except under the conditions named in Rule 3.
3. If any reader desires a reply by post, such can be forwarded by enclosing, in addition to the coupon, a stamped addressed envelope and either stamps or a Postal Order to the value of one shilling.
4. No original documents should be forwarded, but copies only. We cannot hold ourselves responsible for any losses which occur through non-observance of this rule.

'A. G.'—Yes, the widow of the late Emperor of Germany was heir-*presumptive* to the English throne. She is the daughter of our Queen, and was born November 21, 1840. Her brother, the present Prince of Wales, was born November 9, 1841. Between these dates, that is for nearly a year, the baby princess was heir-presumptive. The correct title in this connection of the Prince of Wales is heir-*apparent*. It will perhaps be useful if I define the two titles named. The *heir-apparent* is he whose right of inheritance cannot be defeated, provided he outlives his ancestor. The *heir-presumptive* is he who, if the ancestor should die immediately, would be his heir, but whose right of inheritance may be defeated by the contingency of some nearer heir being born —as a brother or a nephew—whose hopes may be blighted by the birth of a child, or a daughter whose presumptive succession may be destroyed by the birth of a brother.

'ANNOYED.'—You can legally prevent the photographer from selling copies of your photograph, and also from exhibiting them in his shop window.

'OLIVE.'—The application for the situation of Female Telegraph Learner in the General Post Office should be addressed to the Civil Service Commissioners, Cannon Row, Westminster. The limits of age are 15 and 18. The scale of pay is 10s. a week on joining the School, and advances by 1s. 6d. a week annually to 30s. The examination for admission to the School is held in the following subjects:—(1) Handwriting, (2) Orthography, (3) English Composition, (4) Arithmetic (Vulgar and Decimal Fractions and Percentages), (5) Geography. The dates of the examinations are advertised in the newspapers, and are held as often as the necessities of the service require. The competition is very keen. If you intend to enter, you should at once place yourself in the hands of a 'Specialist Coach.'

'W.M.B.'—(1.) You cannot sit at a Training College. (2.) If you are living near a town in which there is an Art School or Class, apply to its Secretary for permission to sit next May. If not, write the Secretary, Science and Art Department, South Kensington, for the name of the Special Local Secretary for your district, and make application to him. My knowledge of the text-books on the subject is so antiquated that I cannot advise you as to the good ones now in the market.

'M.L.'—The dismissal is illegal. You can, by means of a long and expensive lawsuit, obtain your rights, but I fear not otherwise. The Education Department have at present no power in the matter. Mr. Acland has, however, stated that the Government are considering the possibility of legislation on this most difficult question.

'WHITWORTH SCHOLARSHIPS.'—You can obtain full details from the 'Whitworth Prospectus,' price 5d., which may be obtained from the Secretary, Science and Art Department, South Kensington, S.W.

'L.R.'—No. A teacher on the recognised staff of any Elementary School, Board or Voluntary, cannot be a member of a School Board; neither can he hold any paid office (outside that of a teacher) under any School Board.

'M.W.'—The Department have stated that 'the right to superintend Pupil Teachers already possessed' by a teacher is not withdrawn by Art. 61 of the Code. Send your Certificate to the Department, with a short statement of facts, and it will be returned stamped to that effect. You are recognised as qualified to superintend Pupil Teachers. (See Yoxall and Organ's Code, page 17, foot-note.)

'BESSIE.'—(1.) Straight lines serve the purpose very well. (2.) I am unable to recommend any special publication.

'MISTRESS.'—The Education Department has the power to reduce the grant under the circumstances detailed.

Replies by post to 'G.W.,' 'R.M.,' 'SCIENCE,' and 'W.S.'

L'AVARE.

(*Molière.*)

TRANSLATED BY PROFESSOR DARQUÉ.—(*Author of 'Pupil Teachers' French Course.'*)

L'AVARE.

HARPAGON. Tu as bien fait ; et je t'en remercie.

FROSINE. J'aurais,[156] monsieur, une petite prière à vous faire. (*Il prend un air sérieux.*) J'ai un procès que je suis sur le point de perdre, faute d'un peu d'argent, et vous pourriez facilement me procurer le gain de ce procès, si vous aviez quelque bonté pour moi . . . Vous ne sauriez croire le plaisir qu'elle aura de vous voir. (*Harpagon reprend un air gai.*) Ah ! que vous lui plairez ! et que votre fraise à l'antique fera sur son esprit un effet admirable ! Mais surtout elle sera charmée de votre haut-de-chausses, attaché au pourpoint avec des aiguillettes. C'est pour la rendre folle de vous ; et un amant aiguilleté sera pour elle un ragoût merveilleux.

HARPAGON. Certes, tu me ravis de me dire cela.

FROSINE. En vérité, monsieur, ce procès m'est d'une conséquence tout à fait grande. (*Harpagon reprend son air sérieux.*) Je suis ruinée, si je le perds ; et quelque petite assistance me rétablirait mes affaires . . . Je voudrais[157] que vous eussiez vu le ravissement où elle était, à m'entendre parler de vous. (*Harpagon reprend son air gai.*) La joie éclatait dans ses yeux, au récit de vos qualités ; et je l'ai mise enfin dans une impatience extrême de voir ce mariage entièrement conclu.

HARPAGON. Tu m'as fait grand plaisir, Frosine, et je t'en ai, je te l'avoue, toutes les obligations du monde.

FROSINE. Je vous prie, monsieur, de me donner le petit secours que je vous demande. (*Harpagon reprend un air sérieux.*) Cela me remettra sur pied, et je vous en serai éternellement obligée.

HARPAGON. Adieu. Je vais achever mes dépêches.[158]

FROSINE. Je vous assure, monsieur, que vous ne sauriez jamais me soulager dans un plus grand besoin.

HARPAGON. Je mettrai ordre que mon carosse[159] soit tout prêt, pour vous mener à la foire.

FROSINE. Je ne vous importunerais pas, si je ne m'y voyais forcée par la nécessité.

HARPAGON. Et j'aurai soin qu'on soupe de bonne heure, pour ne vous point faire malades.

FROSINE. Ne me refusez pas la grâce dont je vous sollicite. Vous ne sauriez croire, monsieur, le plaisir que . . .

HARPAGON. Je m'en vais. Voilà qu'on m'appelle. Jusqu'à tantôt.

THE MISER.

HARPAGON. You did quite right, and I thank you for it.

FROSINE. I have, sir, a little request to address to you. (*He assumes a serious look.*) I have a lawsuit, which I am on the point of losing for want of a little money, and you could easily secure to me the winning of that lawsuit if you had some kindness for me . . . You cannot believe how pleased she will be to see you. (*Harpagon resumes a pleasant look.*) Ah ! how much you will please her ! and what an admirable effect your old-fashioned ruff will produce on her mind ! But she will be especially delighted with your hose tagged to your doublet with hooks and eyes. That is sufficient to make her fall in love with you ; and she will be charmed with a lover wearing hooks and eyes.

HARPAGON. You certainly delight me by telling me that.

FROSINE. Really, sir, this lawsuit is a matter of great importance to me. (*Harpagon resumes his serious looks.*) I am ruined if I lose it ; and a little help would set my affairs right . . . I wish you had witnessed her transport of joy on hearing me speak of you. (*Harpagon resumes his pleased looks.*) Her eyes shone with joy at the narrative of your qualities ; and I at last made her extremely impatient to see this marriage entirely concluded.

HARPAGON. You have pleased me very much, Frosine, and I confess I am most obliged to you.

FROSINE. Be kind enough, sir, to give me the little help I ask of you. (*Harpagon resumes a serious look.*) That will set me up again, and I shall be infinitely obliged to you.

HARPAGON. Farewell. I am going to finish my letters.

FROSINE. I assure you, sir, that you could never relieve me in a case of greater urgency (need).

HARPAGON. I shall see that my carriage is quite ready to take you to the fair.

FROSINE. I should not trouble you, if necessity did not compel me to do so.

HARPAGON. And I shall take care that supper is served early in order not to make you ill.

FROSINE. Do not refuse me the favour I ask you. You cannot believe, sir, the pleasure which . . .

HARPAGON. I am going. They are calling me. I shall see you again by-and-by.

NOTES.

(156) *J'aurais.* The use of this conditional can only be justified on the supposition that *si vous le permettez* or some equivalent expression is understood.

(157) *Je voudrais que vous eussiez vu.* Notice the frequency of this mode of expression.

(158) *Dépêches*, instead of *lettres* ; the former term is generally used only in reference to important public matters.

(159) *Carosse* is now vulgar, though *carossier*, carriage builder, is still the only term in use. *Voiture* has usurped the place of *carosse*.

FROSINE (*seule*). Que la fièvre te serre, chien de vilain à tous les diables ! Le ladre a été ferme à toutes mes attaques ; mais il ne me faut point pourtant quitter la négociation ; et j'ai l'autre côté, en tout cas, d'où je suis assurée de tirer [160] bonne récompense.

FROSINE. The deuce take you, demon of a skin-flint ! The stingy fellow has resisted all my attacks ; but I must not, however, break off the transaction ; and I have, at any rate, the other party, from whom I am sure to obtain a good reward.

(160) *Tirer*, literally, 'to draw.'

ACT III.

ARGUMENT.*

Harpagon is about to entertain at supper Anselme and Mariane ; he makes all his preparations, and gives out his orders. Dame Claude is directed to dust thoroughly everywhere, yet without rubbing the furniture too much, and she is, moreover, appointed to the government of the bottles. Brindavoine and La Merluche shall rinse the glasses, and hand round the wine discreetly, taking care not to urge the guests to drink. (Scenes I. and II.) Élise must 'look after all that is cleared off the table,' and, together with Cléante, greet in the heartiest manner their future step-mother. (Scenes III. and IV.) As for Maître Jacques, he is both cook and coachman ; in the former capacity he engages to turn out a handsome supper, provided he is supplied with plenty of money ; but Valère proves to him that the part of a clever man is, on the contrary, to give good cheer at as cheap a rate as possible ; and *Mr. Steward* undertakes to regulate the whole business himself, according to sound hygienic principles, and with due regard to wise economy. As a coachman, Maître Jacques declares that it is quite out of the question for him to use the horses ; the poor creatures are made to keep such austere fasts that they cannot walk ; 'they are nothing but phantoms, ideas, and mere shadows of horses.' By degrees, the poor servant, who, in spite of himself, is fond of his master, is led by a feeling of indignation to reveal the whole truth ; everywhere Harpagon is laughed at ; he is the joke of the whole neighbourhood, and 'no one ever mentions him but under the names of miser, stingy, mean, niggardly fellow.' A beating is all that La Flèche † gets as the reward for his honesty. (Scene V.) He wishes to vent his wrath on the steward, whom he believes to be nothing but a coward ; his boldness, however, stands him in no better stead than his sincerity. Thrashed by Valère, he swears to be revenged. (Scene VI.) Meanwhile Frosine introduces Mariane ; the poor young girl, who has already received numerous visits from Cléante, and is more than half inclined to love him, does not see without dismay the grotesque figure of the old miser, and finds no solace either in the strange comfort administered by Frosine, or in Harpagon's ridiculous compliments. (Scenes VII. to IX.) Great is her surprise when she recognises in her future step-son the young man who has contrived to touch her heart ; in the very presence of Harpagon, who is easily duped, she exchanges with him professions of love and of fidelity, scarcely disguised. (Scenes X. and XI.) Cléante offers her, in his father's name, and at his expense, an elegant collation ; and taking from the old man's finger a diamond ring, he entreats Mariane to keep it ; it is a present made by Harpagon, and the exasperated *fesse-mathieu* does not protest (Scene XII.) ; he is thus compelled to be generous in spite of himself.

SCÈNE PREMIÈRE.

HARPAGON, CLÉANTE, ÉLISE, VALÈRE, DAME CLAUDE, MAÎTRE JACQUES, LA MERLUCHE, BRINDAVOINE.

HARPAGON. Allons. Venez çà tous, que je vous distribue mes ordres pour tantôt, et règle à chacun son emploi. Approchez, dame Claude. Commençons par [161] vous. (*Elle tient un balai.*) Bon, vous voilà les armes à la main. Je vous commets au soin de nettoyer partout ; et surtout, prenez garde de ne point frotter les meubles trop fort, de peur de les user. Outre cela, je vous constitue, pendant le souper, au gouvernement des bouteilles ; et s'il s'en écarte quelqu'une, et qu'il se casse quelque chose, je m'en prendrai a vous, et le rabattrai sur vos gages.

MAÎTRE JACQUES (*à part*). Châtiment politique.

HARPAGON (*à dame Claude*). Allez.

SCENE I.

HARPAGON, CLÉANTE, ÉLISE, VALÈRE, DAME CLAUDE, MAÎTRE JACQUES, LA MERLUCHE, BRINDAVOINE.

HARPAGON. Now then. Come here, all of you, that I may give you my orders for by-and-by, and assign to each his duty. Draw near, Dame Claude. Let us begin with you. (*She holds a broom.*) Good, there you are arms in hand. I assign to you the care of cleaning everywhere ; and, above all, take care not to rub the furniture too hard for fear of wearing it out. Besides that, I appoint you, during the supper, superintendent of the bottles ; and if any be mislaid, or there be anything broken, I shall hold you responsible, and shall deduct it from your wages.

MASTER JACQUES. A political punishment.

HARPAGON (*to Dame Claude*). You may go.

(161) *Commençons par*, and not *avec*, because the latter preposition means 'in company with,' or is used before the name of the thing wherewith another is made or done.

* The above argument is the property of M. Gustave Masson's edition of 'l'Avare.'—(Hachette & Cie.)

† *La Flèche* should be *Maître Jacques ;* the mistake is in Masson's Edition.

SCÈNE II.

HARPAGON, CLÉANTE, ÉLISE, VALÈRE, MAÎTRE JACQUES, BRINDAVOINE, LA MERLUCHE.

HARPAGON. Vous, Brindavoine, et vous, La Merluche, je vous établis dans la charge de rincer les verres et de donner à boire ; mais seulement lorsque l'on aura soif, et non pas selon la coutume de certains impertinents de laquais qui viennent provoquer les gens, et les faire aviser de boire, lorsqu'on n'y songe [162] pas. Attendez qu'on vous en demande plus d'une fois, et vous [163] ressouvenez de porter toujours beaucoup d'eau.

MAÎTRE JACQUES (*à part*). Oui ; le vin pur monte à la tête.

LA MERLUCHE. Quitterons-nous nos souquenilles, monsieur ?

HARPAGON. Oui, quand vous verrez venir les personnes ; et gardez bien de gâter vos habits.

BRINDAVOINE. Vous savez bien, monsieur, qu'un des devants de mon pourpoint est couvert d'une grande tache de l'huile de la lampe.

LA MERLUCHE. Et moi, monsieur, que j'ai mon haut-de-chausses tout troué par derrière, et qu'on me voit, révérence parler . . .

HARPAGON (*à La Merluche*). Paix ! Rangez cela adroitement du côté de la muraille, et présentez toujours le devant au monde. (*Harpagon met son chapeau au-devant de son pourpoint pour montrer à Brindavoine comment il doit faire pour cacher la tache d'huile.*) Et vous, tenez toujours votre chapeau ainsi, lorsque vous servirez.

SCÈNE III.

HARPAGON, CLÉANTE, ÉLISE, VALÈRE, MAÎTRE JACQUES.

HARPAGON. Pour vous, ma fille, vous aurez l'œil sur ce que l'on desservira, et prendrez garde qu'il ne s'en fasse aucun dégât. Cela sied bien aux filles. Mais cependant [164] préparez-vous à bien recevoir ma maîtresse qui vous doit venir visiter, et vous mener avec elle à la foire. Entendez-vous ce que je vous dis ?

ÉLISE. Oui, mon père.

SCÈNE IV.

HARPAGON, CLÉANTE, VALÈRE, MAÎTRE JACQUES.

HARPAGON. Et vous, mon fils le damoiseau, à qui j'ai la bonté de pardonner l'histoire de tantôt, ne vous allez pas aviser non plus de lui faire mauvais visage.

CLÉANTE. Moi, mon père ? mauvais visage ! Et par quelle raison ?

HARPAGON. Mon Dieu, nous savons le train des enfants dont les pères se remarient, et de quel œil ils ont coutume de regarder ce qu'on appelle belle-mère. Mais si vous souhaitez que je perde [165] le souvenir de votre dernière fredaine, je vous recommande, surtout,

SCENE II.

HARPAGON, CLÉANTE, ELISE, VALÈRE, MAÎTRE JACQUES, BRINDAVOINE, LA MERLUCHE.

HARPAGON. As for you, Brindavoine, and you, La Merluche, I appoint you to the office of rinsing the glasses and pouring out the drink ; but only when the guests are thirsty, and not according to the custom of certain impertinent servants who provoke people, and make them think of drinking when they are not thinking of it. Wait till you are asked more than once, and remember to always bring plenty of water.

MASTER JACQUES (*aside*). Yes ; neat wine rises to the head.

LA MERLUCHE. Shall we take off our smock-frocks, sir ?

HARPAGON. Yes, when you see the people coming ; and take great care not to spoil your clothes.

BRINDAVOINE. You are well aware, sir, that one of the fronts of my doublet is covered with a large stain of lamp-oil.

LA MERLUCHE. And I, sir, that my hose has a large hole behind, and that, with due respect be it said, people can see my . . .

HARPAGON (*to La Merluche*). Silence. Turn that skilfully towards the wall, and always show your front to the people. (*Harpagon puts his hat in front of his doublet to show Brindavoine how he is to proceed in order to hide the oil stain.*) And you, always hold your hat thus while you wait at table.

SCENE III.

HARPAGON, CLÉANTE, ÉLISE, VALÈRE, MAÎTRE JACQUES.

HARPAGON. As for you, my daughter, you will keep your eye upon what will be removed from the table, and take care that nothing is wasted. That becomes girls well. But, meanwhile, prepare yourself to welcome my sweetheart, who is coming to see you, and take you with her to the fair. Do you hear what I am telling you ?

ÉLISE. Yes, father.

SCENE IV.

HARPAGON, CLÉANTE, VALÈRE, MAÎTRE JACQUES.

HARPAGON. And you, my fop of a son, whom I am indulgent enough to pardon your recent scrape, do not take it into your head to receive her unkindly.

CLÉANTE. I, father ? an unkind reception ! And for what reason ?

HARPAGON. Dear me, we know the behaviour of children whose fathers marry again, and in what manner they usually look upon what is called a step-mother. But if you wish me to lose the remembrance of your last mad prank, I recommend you, especially, to show a

(162) *Songer*, to dream, is frequently used instead of *penser*, to think.

(163) *Vous ressouvenez.* When two verbs in the imperative affirmative closely follow one another, the personal pronoun governed by the latter may be placed before it.

(164) *Cependant* is now more often used to mean 'however' than in its proper sense.

(165) *Je perde.* All verbs expressing a wish require the verb of the subordinate sentence to be in the subjunctive mood.

de régaler d'un bon visage[166] cette personne-là, et de lui faire enfin tout le meilleur accueil qu'il vous sera possible.

CLÉANTE. A vous dire le vrai, mon père, je ne puis promettre d'être bien aise qu'elle devienne ma belle-mère. Je mentirais, si je vous le disais ; mais, pour ce qui est de la bien recevoir, et de lui faire bon visage,[166] je vous promets de vous obéir ponctuellement sur ce chapitre.

HARPAGON. Prenez-y garde au moins.

CLÉANTE. Vous verrez que vous n'aurez pas sujet de vous en plaindre.

HARPAGON. Vous ferez sagement.

SCÈNE V.

HARPAGON, VALÈRE, MAÎTRE JACQUES.

HARPAGON. Valère, aide-moi à ceci. Oh ! çà, maître Jacques, approchez-vous ; je vous ai gardé pour le dernier.

MAÎTRE JACQUES. Est-ce à votre cocher, monsieur, ou bien à votre cuisinier, que vous voulez parler ? car je suis l'un et l'autre.

HARPAGON. C'est à tous les deux.

MAÎTRE JACQUES. Mais à qui des deux le premier ?

HARPAGON. Au cuisinier.

MAÎTRE JACQUES. Attendez donc, s'il vous plaît.

(*Maître Jacques ôte sa casaque de cocher, et paraît vêtu en cuisinier.*)

HARPAGON. Quelle diantre de cérémonie est-ce là ?

MAÎTRE JACQUES. Vous n'avez qu'à parler.

HARPAGON. Je me suis engagé, maître Jacques, à donner ce soir à souper.

MAÎTRE JACQUES (*à part*). Grande merveille !

HARPAGON. Dis-moi un peu, nous feras-tu bonne chère ?

MAÎTRE JACQUES. Oui, si vous me donnez bien de l'argent.

HARPAGON. Que diable ! toujours de l'argent ! Il semble qu'ils n'aient autre chose à dire, de l'argent, de l'argent ! Ah ! ils n'ont que ce mot à la bouche, de l'argent ! toujours parler d'argent ! Voilà leur épée de chevet,[167] de l'argent !

VALÈRE. Je n'ai jamais vu de réponse plus impertinente que celle-là. Voilà une belle merveille que de faire bonne chère avec bien de l'argent ! C'est une chose la plus aisée du monde, et il n'y a si pauvre esprit qui n'en fît bien autant ; mais, pour agir en habile homme, il faut parler de faire bonne chère avec peu d'argent.

MAÎTRE JACQUES. Bonne chère avec peu d'argent ?

VALÈRE. Oui.

MAÎTRE JACQUES (*à Valère*). Par ma foi, monsieur l'intendant, vous nous obligerez de[168] nous faire voir ce secret, et de prendre mon office de cuisinier ; aussi bien vous mêlez-vous céans d'être le factoton.

HARPAGON. Taisez-vous. Qu'est-ce qu'il nous faudra ?

pleasant face to that person, and to welcome her in your best manner.

CLÉANTE. To tell you the truth, father, I cannot promise to be glad she should become my step-mother. I should speak an untruth if I told you so ; but, as for receiving her well, and showing her a kind face, I promise you to obey you punctually on that chapter.

HARPAGON. Take care you do so, at least.

CLÉANTE. You will see that you will have no reason to complain.

HARPAGON. You will do wisely.

SCENE V.

HARPAGON, VALÈRE, MAÎTRE JACQUES.

HARPAGON. Valère, help me in this matter. Now then ! Master Jacques, draw near ; I have kept you for the last.

MASTER JACQUES. Is it to your coachman, sir, or to your cook that you wish to speak ? for I am both.

HARPAGON. It is to both of them.

MASTER JACQUES. But to which of them first ?

HARPAGON. To the cook.

MASTER JACQUES. Pray wait a little, if you please.

(*Master Jacques takes off his coachman's coat, and appears in the dress of a cook.*)

HARPAGON. What strange ceremony is that ?

MASTER JACQUES. You have only to speak.

HARPAGON. I have resolved, Master Jacques, to give a supper this evening.

MASTER JACQUES (*aside*). What a wonder !

HARPAGON. Pray, tell me, will you give us good cheer ?

MASTER JACQUES. Yes, if you give me plenty of money.

HARPAGON. What, the deuce ! always money ! It seems they have nothing else to say, money, money ! Ah ! they have only that word in their mouths, money ! always speak of money ! That is their continual saying, money !

VALÈRE. I never heard a more impertinent answer than that one. That is, indeed, a great wonder to make good cheer with plenty of money ! It is the easiest thing in the world, anybody can do as much ; but, to act as a clever man, one must talk of making good cheer with little money.

MASTER JACQUES. Good cheer with little money ?

VALÈRE. Yes.

MASTER JACQUES (*to Valère*). Upon my word, Mr. Steward, you will oblige us by showing us that secret, and taking my situation as cook ; for you undertake here also the part of factotum.

HARPAGON. Hold your tongue. What shall we require ?

(166) *Régaler d'un bon visage.* Throughout the preceding two and the present scenes Harpagon tries to suit his language to the solemnity of the occasion.

(167) *Leur épée de chevet.* An allusion, most probably, to the habit of some people who slept with a sword under their pillow.

(168) *Obligerez.* Notice that *obliger de* often means 'to compel' ; *il fut obligé de le faire*, 'he was compelled to do it.'

MAÎTRE JACQUES. Voilà monsieur votre intendant, qui vous fera bonne chère pour peu d'argent.

HARPAGON. Haye ! je veux que tu me répondes.

MAÎTRE JACQUES. Combien serez-vous de gens à table ?

HARPAGON. Nous serons huit ou dix ; mais il ne faut prendre que huit. Quand il y a à manger pour huit, il y en a bien pour dix.

VALÈRE. Cela s'entend.

MAÎTRE JACQUES. Eh bien, il faudra quatre grands potages[169] et cinq assiettes . . . Potages . . Entrées.

HARPAGON. Que diable, voilà pour traiter toute une ville entière.

MAÎTRE JACQUES. Rôt . . .

HARPAGON (*lui mettant la main sur la bouche*).[170] Ah, traître, tu manges tout mon bien.

MAÎTRE JACQUES. Entremets . . .

HARPAGON (*mettant encore la main sur la bouche de maître Jacques*). Encore ?

VALÈRE (*à maître Jacques*). Est-ce que vous avez envie de faire crever tout le monde ? et monsieur a-t-il invité des gens pour les assassiner à force de mangeaille ? Allez-vous-en lire un peu les préceptes de la santé, et demander aux médecins s'il y a rien de plus préjudiciable à l'homme que de manger avec excès.

HARPAGON. Il a raison.

VALÈRE. Apprenez, maître Jacques, vous et vos pareils, que c'est un coupe-gorge qu'une table remplie de trop de viandes ;[171] que pour se bien montrer ami de ceux que l'on invite, il faut que la frugalité règne dans les repas qu'on donne ; et que, suivant le dire d'un ancien, *il faut manger pour vivre, et non pas vivre pour manger*.

HARPAGON. Ah, que cela est bien dit ! Approche, que je t'embrasse pour ce mot. Voilà la plus belle sentence que j'aie entendue de ma vie : *il faut vivre pour manger, et non pas manger pour viv* . . . Non, ce n'est pas cela. Comment est-ce que tu dis ?

VALÈRE. Qu'*il faut manger pour vivre, et non pas vivre pour manger*.

HARPAGON (*à maître Jacques*). Oui, Entends-tu ? (*A Valère.*) Qui est le grand homme qui a dit cela ?

VALÈRE. Je ne me souviens pas maintenant de[172] son nom.

HARPAGON. Souviens-toi de m'écrire ces mots. Je les veux faire graver en lettres d'or sur la cheminée de ma salle.

VALÈRE. Je n'y manquerai pas. Et pour votre souper, vous n'avez qu'à me laisser faire. Je réglerai tout cela comme il faut.

HARPAGON. Fais donc.

MAÎTRE JACQUES. Tant mieux, j'en aurai moins de peine.

HARPAGON (*à Valère*). Il faudra de ces choses dont on ne mange guère et qui rassasient d'abord ; quelque bon haricot bien gras, avec quelque pâté en pot bien garni de marrons.[173]

MASTER JACQUES. There is your steward, who will make you good cheer for little money.

HARPAGON. Ay ! I will have you answer me.

MASTER JACQUES. How many people will there be at table ?

HARPAGON. We shall be eight or ten ; but you must count only eight. When there is enough to eat for eight, there is surely enough for ten.

VALÈRE. That is understood.

MASTER JACQUES. Well, we shall require four large dishes of soup and five plates . . . soups . . . entrées (courses).

HARPAGON. What, the deuce, that is enough to treat a whole town.

MASTER JACQUES. Roast joint . . .

HARPAGON (*placing his hand over his (the cook's) mouth*. Ah ! traitor, you eat all my fortune.

MASTER JACQUES. By-dishes . . .

HARPAGON (*again placing his hand over Master Jacques' mouth*). Again ?

VALÈRE Do you want to make people burst ? and has your master invited people in order to murder them by cramming them ? Pray, go and read the precepts on health, and ask physicians whether there is anything more hurtful to man than excessive eating.

HARPAGON. He is right.

VALÈRE. Learn, Master Jacques, you and the like of you, that a table covered with too many viands is a cut-throat place ; that in order to show oneself the friend of those one invites, it is necessary that frugality should reign in all the repasts that one gives ; and that, according to the saying of an ancient worthy, *one must eat to live, and not live to eat*.

HARPAGON. Ah, how well that is spoken ! Draw near, that I may embrace you for that word. That is the finest maxim I ever heard in my life : *one must live to eat, and not eat to live* . . . No, that is not it. How do you say ?

VALÈRE. That *one must eat to live, and not live to eat*.

HARPAGON (*to Master Jacques*). Yes. Do you hear ? (*To Valère.*) Who is the great man that said that ?

VALÈRE. I do not now remember his name.

HARPAGON. Remember to write those words for me. I will have them engraved in golden letters on the chimney of my dining-room.

VALÈRE. I shall not fail to do so. And as for your supper, leave that to me. I shall settle all that properly.

HARPAGON. Pray, do.

MASTER JACQUES. So much the better, it will be so much less trouble for me.

HARPAGON (*to Valère*). We shall require some of those things of which people do not eat much, and which satisfy at once ; some good stew very fat, with some pie in a dish well filled with chestnuts.

(*To be continued.*)

(169) *Potages et cinq assiettes*, a very indefinite expression, which was made clear in the edition of 1682, thus : *potage bisque, potage de perdrix aux choux verts, potage de santé, potage de canards aux navets. Entrées : fricassée de poulet, tourte de pigeonneaux, ris de veau, boudin blanc à cervelles.*

(170) *Lui mettant la main sur la bouche. Lui* unmistakably shows whose mouth is meant, hence the use of the article before *bouche*, instead of the possessive pronoun required in English.

(171) *Viande* is now seldom used in any other sense but that of 'meat.'

(172) *Se souvenir* requires *de* before the name of the thing remembered, but *se rappeler* does not, because it literally means 'to recall to oneself.'

(173) *Marrons*, more generally called *châtaignes*, probably because the former name is also given to 'horse-chestnuts.'

NOTES AND NOTIONS.

BY RICHARD WADDINGTON,
Ex-President of the Half-Time Council of Teachers.

THE Village Parliament has furnished some surprising stories. In perusing the 'Tales and Sayings of William Robert Hicks,' I came across the following:—

'Hicks, as clerk of the Board of Guardians, was taking down the minutes at a meeting, when a member of the Board was looking over his shoulder. This guardian said to him, "I beg to call your attention to a error, Mr. Hicks." "What is that?" said Hicks. "You've a left out the *h* in overplush." On another occasion the name Socrates had to be written—a quotation, perhaps. A man looking over his shoulder said: "Zokrates! (pronounced 'rates') Who's 'ee? I never heerd of 'un." Hicks looked up rather surprised when the man corrected himself by saying, "'Cept in the Scriptur."'

* * * * *

THE Ampney St. Peter's case raises several questions of serious import to the teachers, but by no means can the questions raised be said to be of pedagogic interest only. Much has been written and spoken concerning the management of schools. Again and again the Law Committee of the Union are cognisant of the fact that there is but one manager, although on paper it would appear that there is a very representative array. The first question, and it is a question of serious moment, is as to the power of the Chairman of the Committee of Managers to disqualify his colleagues when they refuse to answer his call and think for themselves. Briefly, the Cirencester case is: The Vicar, who is chairman of the committee of five managers, is anxious to remove the master. The master's record admits of no attack. On his own responsibility the Vicar opens the attack. Driven to an appeal to his colleagues, the Vicar finds the matter going against him, and adjourns the meeting. In the meantime the Vicar announces that the three managers who oppose him have no legal status, thus reducing the Committee to himself and his only supporter. Thanks to the energy of Mr. Organ and the Law Committee, the legality of the Vicar's action is to be tested before one of Her Majesty's judges. Nothing is more likely to discredit the Voluntary System than such attempts to bring Committees of Management into mere automatic registers of the will of an individual.

* * * * *

THE 'Age Circular' is now public property. Despite the condemnation by all educationists of attempts to classify children by age, and notwithstanding the Education Department's acknowledgment of the truth of that condemnation in the ordinary school routine, yet the Science and Art Department is so oblivious of educational progress, and so little in harmony with the spirit of the time, that an attempt is being made to apply the age clause to the subject of drawing. If there is one subject more than another that does not admit of the application of the cast-iron age rule, it is the subject of drawing. All children are not born artists. I have read, 'Often the cockloft is empty in those whom Nature hath built many stories high.' It is not true of all our primary school children—

'For he, by geometric scale,
Could take the size of pots of ale.'

But it is absurd to expect the same artistic aptitude in the use of the pencil from every boy of eight years of age. Why not classify by weight? It is quite as likely to be correct.

* * * * *

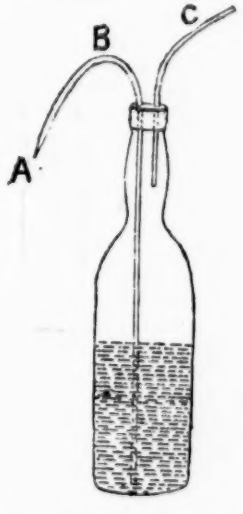
ARE the papers marked at South Kensington dealt with on the lines of this circular? This is a question that ought to be answered. The results are most erratic, and in some measure this circular accounts for much of the disappointment that exists. The truth is, as I have before pointed out, the Science and Art Department is a military and naval hospital. The Department is aware that its Drawing Superintendents have not the knowledge of school life required to safeguard the classification, and hence such instructions. The composition, administration, and organisation of the Science and Art Department demands the attention of Mr. Acland, and that soon. Why should there be two departments dealing with education? The atmosphere at Whitehall is as invigorating and equable as that of South Kensington is musty and vitiating. I am glad to see the Executive of the N.U.T. is taking up the question of the co-ordination of the two departments.

* * * * *

THE other day I visited some schools in Leicester. Every teacher knows the danger of an epidemic. It always is a puzzle to me that more attention is not paid to the sanitation of our schools by the Local Sanitary Authorities. By a little foresight much of the sickness might be averted, and in no place is this more true than in the primary schools. In the Leicester Board Schools the caretaker must water the passages with a disinfecting fluid every day. Not very costly, but very efficacious, I should think.

* * * * *

THE filling of ink-wells is a problem that has brought forth many patents. Few of these are really successful. For some time I have had three bottles arranged on the same principle as the wash-bottles of the chemical laboratory, and they have worked admirably. The production is inexpensive, and not difficult to work.



Requisites.—(1.) A pint wine-bottle with a fairly long neck to facilitate holding.

(2.) Take a long piece of glass tubing, twice as long as the bottle. Break this in two parts, three quarters and a quarter of the length, by holding over the gas jet. Turn gently to facilitate the distribution of the heat, and as the glass softens draw the parts asunder. This will give the pointed end to A. Repeat the heating at C, and bend carefully. Don't make the bend too acute, or it will break very easily. File off the pointed end of the remaining piece of tubing, and heat and bend for B. Take a good cork and bore two holes rather smaller than the diameter of the tube. Pass the two pieces through the cork, fill the bottle with ink, and insert the cork containing the tubes, taking care to make the cork as air-tight as possible. Place the tube A in the ink-well and gently blow down B. For a few pence a very useful ink-filler may be had which can be easily taken to pieces and cleansed.

* * * * *

THE Right Honourable A. J. Balfour gave utterance to a condemnation of the present spelling craze in the Civil Service Examination that well might be applied to the demands of the Education Department. He said:—

'He had come across numerous examples of otherwise capable men who, through some defect of the eye more than anything else, had failed to acquire the strange art of spelling the English language. This art depended on no rule and tested no intellectual capacity; nevertheless the Civil Service Commissioners had constantly cut out these unfortunate men and made them go through hours of dictation that must have been sheer waste of time from any point of view other than of mechanism.'

* * * * *

AND what of the four millions of scholars in our primary schools who are spending one-fifth of their school lives in seeking after 'the strange art of spelling?' The Education Department has erected spelling into a fetish before whose altar handwriting, the art of expression, and the cultivation of all love of reading must bow the knee.

* * * * *

I HOPE the coming winter will see the teachers leading an agitation against the waste of valuable time caused by our absurd system of weights and measures, and the still greater bugbear of the spelling requirements. Our children do not learn to spell thereby. In a certain beaten track their accuracy is marvellous, but immediately they are emancipated from this drudgery they spell abominably. If every Association Meeting would take up these two points, public attention would be directed thereto, and, I feel sure, an attempt at reform would follow.

* * * * *

THE other day I visited the Higher Grade Board School of a large provincial town. Arriving in the street I was not quite sure as to the school, and seeing a man carrying coal into a school I queried, 'Is this the Higher Grade School?' 'I dunno,' was the reply, 'but it's an awful big school!'

* * * * *

AFTER the first of January next no child under eleven years of age can be employed either half or full time. So far so good. But when is that three-year old Berlin pledge to be redeemed? And how is even this latest prohibition to be enforced? Is the enforcement to be left to the illegal employer who sits on the School Board, but who believes education is a dangerous physic that must be administered in very small doses? Thousands of children are illegally employed day by day, and this small army will increase under the new conditions. The Elementary Education (School Attendance) Act which has just been added to the Statute Book will do much for rural England, but a much more comprehensive measure should receive the Royal assent during 1894.

* * * * *

LADIES who are anxious to see the Needlework requirements of the Code on a much more rational basis should keep the matter well to the front during the next month or two. 'My Lords' are considering the question, and the most effective time to make suggestions is at hand. Opinions differ on the question of garments or no garments, but there is absolute unanimity on the excessive requirements of the present schedule. While believing in the making of garments, I would abolish that requirement from the schedule in its present form. There is no use hiding the truth—the children do not *make* the garments. Their part is a very minor one in the production of the finished article, and has little educational value. I have a couple of hundred girls in my school, and I have watched the sewing requirements for many years, and I do not hesitate to affirm that the educational value of the garment is a snare and a delusion. And I go further and say that all the overtime given to the needlework is due to these useless garments. Fair, honest work will not meet the demands made without overtime.

* * * * *

BUT one or two other matters block the way to reform in this matter of needlework. The garments in most schools are sold, therefore the teachers must keep their eyes fixed on the production of saleable articles. This very often means overtime. Again, in many schools the sale of garments covers the total outlay on sewing material. Take a concrete illustration. In a mixed school with an average of 360, the girls averaged 185 for the year, and the shilling grant was claimed and paid for needlework. The financial result reads thus:

	£	s.	d.
Grant on 185 at 1s. - - - -	9	5	0
Cost of Material - - - -	7	10	0
	£1	15	0

Three assistants and two pupil teachers are engaged one-seventh of their time on this subject, and there is the sum of thirty-five shillings left to pay them. How can managers deal with the matter educationally under such conditions? They must, under such conditions, be much concerned as to the return from the sale of the garments. In this subject, and also that of drawing, the Department should be convinced of the financial difficulty. In neither of these subjects is the grant anything like adequate.

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To the right and to the left it is affirmed, 'The making of garments is a necessary part of a girl's education.' Agreed, a thousand times agreed! But does the omission of the pile of garments from the annual Show Day mean that the making of garments will cease? Certainly not; teachers will have more freedom and greater opportunity for assisting Mary with the family mending. I could find any amount of practical mending in my school in the clothes of the

children. Let the children learn how to make a wearable garment. But that is exactly what they are not doing under the present conditions. The garment is cut out, fixed, and arranged by the teacher *in the absence of the children*. The children perform a very mechanical and uneducational part in the production of the garment. To omit the garment from the Third Schedule would not abolish the making of garments, but it would give the teacher an opportunity of teaching needlework in a rational manner. True, the teachers have helped to make the rod for their own backs in their anxiety to do the impossible, but that is no reason why Schedule III. should remain in its present form.

NOTES ON QUICK'S EDUCATIONAL REFORMERS.

(Special Subject set for Second-Year Certificate Students, Christmas, 1893.)

BY THOMAS CARTWRIGHT, B.A., B.SC. (LOND.),

Double Graduate in Mental Science. Author of 'Mental Science and Logic for Teachers,' etc. Co-Director of the Birkbeck Training Classes, and Lecturer therein on School Method.

PESTALOZZI (*continued from page* 196).

The Stanz experiment confirmed Pestalozzi's belief in his mission to teach. Although ignorant, in the ordinary sense of the word, he was eminently qualified for the *rôle* he wished to play, for the simple reason that "*he understood the mind of man and the laws of its development; human affections, and the art of arousing and ennobling them.*" Soon appointed at Burgdorf (near Berne) (1) as teacher of 70 children of non-burgesses, (2) as teacher of the lowest class in school for burgher's children. Here he received his *first official commendation*, the Burgdorf School Commission speaking of his scholars in terms of the highest approbation, so that Pestalozzi became master of the second school of Burgdorf, where, in the opinion of Ramsauer, a pupil—and later on an assistant at Yverdun, (1) 'Master was very kind but very unhappy; (2) children were very ill-behaved and learnt nothing.' This opinion of a child must not be taken for much. Pestalozzi was convinced that the only way to help the poor was '*by changing his schools into true places of education, in which the moral, intellectual, and physical powers which God has put into our nature may be drawn out.*' Hence 'the public common school coach throughout Europe must be turned round and brought into an entirely new road.' His experiments showed him that '*the first hour of learning dates from birth.*' From the very moment that the child's senses open to the impressions of nature, nature teaches it. Its new life is but the faculty, now come to maturity, of receiving impressions. The teacher's work is to give a helping hand to the natural tendency towards proper development. It is thus necessary to discover what faculties are developed at the various stages of school life, and to study the various subjects in order to find out which are the most suitable to the stimulus of the several faculties. This was endeavouring to put teaching on 'a psychological basis, *i.e.*, to make it conform to and assist in the proper unfolding of the various powers which a child possesses, in a dormant condition, at its birth.' And this Pestalozzi thought could be best done by nurturing to the full the child's own observation, so that its knowledge might be got first hand by receiving impressions direct from natural objects by intuition, *i.e.*, by looking at things and ideas with attention and reflection. He recommends the teaching of language, drawing, writing, arithmetic, and the art of measuring, and singing and the love of the beautiful are to be taught, and especially to poorer children, in order to sweeten and humanise their gloomy lives by opening up a due appreciation of the beauties of nature.

Kruesi's arrival with his band of little ones, who had been compelled to leave Gais by the Franco-Austrian war, marks an epoch. After the death of Fischer, who had been instrumental in inviting Kruesi, Pestalozzi and the latter united their forces and worked in concert in Burgdorf Castle, being joined soon after by Tobler (the ex-tutor) and Buss (ex-bookbinder). The children numbered less than a hundred, and Pestalozzi was able to be a father indeed. He and his coadjutors had all things in common.

A training class for teachers was added in 1801, and continued prosperously for three years. 'Pestalozzi has discovered the real and universal laws of all elementary teaching,' was the report of the President of the Council of Education, which was corroborated by various visitors.

Pestalozzi goes to France as member of Swiss deputation, where 'Napoleon did not see Pestalozzi.' The Government of United Switzerland having lapsed, Pestalozzi's Institute lost the sinews of war, and was therefore put to straits, being turned out of the castle of Burgdorf, and relegated to the old convent of Munchenbuchsee, the administration of which was given to Fellenberg, to 'Pestalozzi's profound mortification.' Pestalozzi could not work with the agriculturist, who was 'a man of iron.' Hence the removal to Yverdun (near Neuchatel). His assistants soon followed. The Prussians, after their humiliation by Napoleon, resolved that the best means of restoring the State lay in a good common school education. Queen Louisa appreciates Pestalozzi. 'With what goodness, with what zeal, he labours for the good of his fellow creatures! In the name of humanity I thank him with my whole heart!' Seventeen young Prussians sent for a three years' course at Pestalozzi's Institute, Ritter, Raumer, Herbart, and Froebel being among the number. 'I have seen more than the Paradise of Switzerland, for I have seen Pestalozzi and recognised how great his heart is and how great his genius' (Ritter). The school became too large, and the discipline of affection vanished, leaving no school discipline to replace it. Also the children were of 'every age and every country,' and not amenable to Pestalozzi's system. Hence failure, which was accentuated by discord among assistants, chiefly through Schmid, the mathematician. Herr Girard reports adversely, because he did not understand. Girard spoke of 'mental arithmetic' as reaching a higher pitch of excellence, although ordinary work (slate arithmetic) was weak. This is really high praise, but Girard did not understand Pestalozzi's system, and therefore condemned it. In 1810 Schmid left Yverdun, and Pestalozzi's unrivalled incapacity to govern soon brought chaos, so that Schmid was recalled in 1815, and took Pestalozzi entirely in hand, and soon

Niederer, Elizabeth Naef, and all Pestalozzi's best friends forsook him and fled, in consequence of Schmid's conduct, who was finally expelled from Yverdun Castle by the magistrates. The sparing of Yverdun by the Austrians in 1815 is a proof of Pestalozzi's widespread influence. Dr. Bell's visit did not bring him under the spell of Pestalozzi, and his judgment was at fault when he said 'In another twelve years mutual instruction will be adopted by the whole world and Pestalozzi's method will be forgotten.' The contrary is of course true. The death of his wife in December 1815 increased Schmid's power. 'This,' said Pestalozzi, taking up a Bible, 'is the source whence you (his wife) and I both drew courage, strength, and peace.'

(1.) The receipt of £2,000 (which soon vanished) from the publication by subscription of Pestalozzi's writings, and (2) the success of a school for neglected children at Clindy, somewhat relieved the gloom of failure, but in 1824 the institute, having lasted for twenty years, was closed, and Pestalozzi spent his remaining three years with his grandson at Neuhof, where, on February 17, 1827, aged eighty-one, he died.

The grand change advocated by Pestalozzi was a change of object. *The main object of the school should not be to teach, but to develop;* and so young children are not the fag end, but the important object of an earnest teacher's enthusiastic care. Thus 'Pestalozzi 'compelled the scholastic world to revise the whole of their task, to reflect on the nature and destiny of man, and also the proper way of leading him from his youth towards that destiny.' 'From my youth up I felt what a high and indispensable human duty it is to labour for the poor and miserable, that he may attain to a consciousness of his own dignity through his feeling of universal powers and endowments, which he possesses, awakened in him.' 'Every human being has a claim to a judicious development of his faculties by those to whom the care of his infancy is confided.' Hence mothers must have a '*thinking love*,' and education must consist 'in *a continual benevolent superintendence*, with the object of calling forth all the faculties which Providence has implanted,' the task being '*to superintend and promote the child's development morally, intellectually, and physically.*' The essential principle of education is not teaching, it is love. The child must think, and learn by thinking, and all instruction must be based on *anschauung, i.e.* on self-observation, made with attention and reflection, by which means he may be said to 'intuit' things, that is, to learn their nature, at first hand, by actual experience of them. This principle is in direct antithesis to the then (and even now) prevalent verbalism. (Buisson's remarks on intuition need careful reading.) This agrees with Locke's dictum that *knowing is seeing; and, if it be so, it is madness to persuade ourselves that we do so by other men's eyes, let him use never so many words to tell us that what he asserts is very visible.*' Locke set little store on children's minds, whilst Rousseau even went so far as to wish their minds to remain 'unfurnished apartments to let' until the age of twelve, whereas with Pestalozzi a child's education begins with its life. His aim was that children should 'know about much but know little. They are taught not *what* to think but *to think*, and to exercise their powers of observation and draw conclusions from their own experiences. The teacher simply furnishes materials and occasions for this exercise in observing.' They thus learn slowly, but thoroughly. Again, 'whenever children are inattentive the teacher should first look to himself for the reason.' Singing for happiness promotion, and drawing as an aid to observation training, are to be well to the front. (Morf's summing up cannot be condensed: it must be gone over carefully and compared with Joseph Payne's summary.)

Quick next shows that both as regards the rich and the poor the English educational coach is not turned in the right direction. The mother, the nursemaid, the preparatory school teacher, all are ignorant of the true needs of the child, and although the Public School trains the body, and also has an excellent effect in moulding the character, still the only thing the school manager thinks of is, How much do the little boys learn of what is taught in the higher forms? How their faculties are being developed, or whether they have any faculties except for reading, writing, and arithmetic, and for getting grammar rules, &c., by heart, he is not so 'unpractical' as to inquire.

As to the elementary school, the condemnation is equally sweeping. 'In these schools the heart and the affections are not thought of; the powers of neither mind nor body are developed by exercise, and the children do not acquire any interests that will raise or benefit them.' The pupil teacher system is rotten. The author's censure of Robert Lowe is just, and the existence of a science of Education will ultimately be realized and obeyed. The teacher and not the time-table makes or mars a school, and herein rests the weakness of the elementary school. Quick explains that the abolition of payment by results and the introduction of freedom of classification have modified the sad state of affairs referred to, and we may add that the abolition of the Annual Inspection Day and the introduction of Intermittent Inspection will do more. The tide has turned, and progress is now being made in the right direction, and the work of such (so-called) theorists and faddists as Pestalozzi is at last bearing fruit amongst us. Much remains to be done, and Pestalozzi, with his high ideal of education, is still the pioneer from whom we may learn the right way to do it.

SCIENCE NOTES.

VOLCANIC ACTIVITY IN JAPAN.—The Fukushima district in Japan has lately been showing signs of volcanic activity. The mountains in this neighbourhood include Bandaisan, which was the scene of a very destructive eruption some few years ago. On June 4, early in the afternoon, there was an earthquake, which was followed by an eruption of the peak known as Azuma-Yama next morning. The disturbance spread, and soon other peaks in the neighbourhood became active, showers of stones and ash being scattered broadcast, and much damage resulting. When the eruption had somewhat spent itself, an expedition was undertaken under the auspices of the Geological Section of the Agricultural Department. Azuma-Yama was ascended, and observations made of the immediate vicinity of the craters. The eruption was not uniform, from one crater only heated air being emitted, while from another vapour and ashes were thrown, with heated fragments of rock from time to time. A sad fatality attended another expedition a day or two later. Two engineers, accompanied by two students of the University of Japan,

started to explore the region of the craters, but while they were on their way a violent eruption occurred, fragments of rock and dense volumes of gas being thrown out. The two engineers unfortunately were overcome by the fumes, and perished.

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EARLY METHODS OF WORKING IN STONE.—During the past two years some work has been carried on by Mr. J. D. McGuire with a view to reproducing aboriginal methods of work in stone, with weapons of stone, wood, and bone. Many such implements are continually being unearthed in village sites in America and Europe. Mr. McGuire has also experimented with tools actually found in graves and with those still used by savage races. As the result of his experiments he comes to the conclusion that chipping was later in date than grinding and battering stone.

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NEW METHOD OF STAINING MICRO-ORGANISMS.—The recent development of bacteriology has led to considerable research into methods of staining protoplasm, and many very intricate modes have been described by various workers. Generally the difficulty has been to select the most appropriate mordant to enable the stain to be fixed in the organism, and very slight alterations of either the alkalinity or acidity most favourable have been attended with bad results. One of the most successful methods is that of Loeffler, which depends upon such care in the selection of the mordant. The relation of the acidity or alkalinity to the mordant is in his process the most critical part of the operation, varying with the different microbes. Recently it has been shown by Nicolle and Morax that the difficulties offered in the original process can be avoided. Their modification consists in applying the mordant to a culture which has dried on a cover-glass, heating it over a flame till it begins to steam and then washing it, repeating this operation several times. The micro-organisms are then found to stain with ordinary aqueous solution of violet. The repeated application of the mordant is as effectual as the single application plus the acid or alkali.

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SENSITIVENESS OF MUSCLES.—Some experiments have been carried out by M. d'Arsonval which somewhat modify the current ideas as to the power of muscles to respond to stimulation. It has generally been taken that the power of responding by a contraction to the stimulus administered by a nerve is a sufficient test of the vitality of the muscle. By this test it has been found that the sensibility of the muscle very speedily vanishes after the death of the animal, especially in the case of warm-blooded animals. M. d'Arsonval comes to the conclusion, however, that the irritability, though much lessened, by no means disappears so quickly, and demonstrates its existence by means of a new instrument, based upon the principle of the microphone. This instrument, when connected with a muscle under experiment, gives a sound on the nerve being stimulated, the sound corresponding to the rhythmic vibrations of the muscle which precede and accompany the actual shortening. The experiments are of great interest to physiologists, showing that under conditions of very feeble excitation nerves may act on muscles without causing actual contraction, only setting up a simple molecular vibration.

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SCIENCE LECTURES AT THE VICTORIA HALL.—The indefatigable band of workers at the great Waterloo Road centre, headed by Miss Martineau and Miss Cons, have issued their autumn programme of lectures and other educational work. The lectures for September have included a discourse by Capt. Chas. Reade, R.N., on New Zealand and the noble Maori, while Prof. Malden has dealt with Ireland, Australia, and the Chicago Exhibition. A varied programme of scientific education is a special feature of the work at the Victoria Hall.

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THE LATE MR. GEO. BROOK.—Zoological science has recently suffered a great loss by the early death of Mr. G. Brook of Edinburgh, so well known in connection with the *Challenger* reports. Mr. Brook died suddenly while out shooting near Newcastle-on-Tyne. His career, though short, has been successful in the highest sense, the position he won among zoologists being one of the foremost of those of the younger school. Beginning his scientific work by biological investigations in the West Riding of Yorkshire, he was in 1884 appointed scientific assistant to the Scottish Fishery Board and lecturer on comparative embryology to the University of Edinburgh. His work includes a series of notes and reports on food fishes; a paper on the origin of the endoderm from the periblast in teleostean fishes; the *Challenger* report on the Antipatharia; a paper on the homologies of the mesenteries in the Antipatharia and the Actinozoa; and the 'Catalogue of the Genus Madrepora' just published by the trustees of the British Museum. It was in consequence of the admirable manner in which he worked out the Antipatharians of the *Challenger* collection that the authorities of the British Museum entrusted the arrangement and cataloguing of their collection of stony corals to him. The outcome of the last three years of his life's work is embodied in this catalogue, which is enriched by 35 beautiful plates, mostly prepared from his own photographs.

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BIOLOGICAL SURVEY OF THE STATE OF INDIANA.—Under the direction of the Indiana Academy of Science, a biological survey of the State is about to be undertaken. It has been entrusted to Profs. L. M. Underwood, C. H. Eigenmann, and V. F. Marsters, who propose to prepare for publication a complete bibliography of materials bearing on botany, zoology, and palæontology. A first step will thus be taken towards a full discussion of the flora and fauna, with their distribution, biological relations, and economic importance.

NOTES ON HONOURS PHYSIOGRAPHY.

BY R. A. GREGORY, F.R.A.S., AND H. G. WELLS, B.SC.

OUR notes this month are concerned chiefly with two matters of recent interest. One of these is the behaviour of what were once called the permanent gases at extremely low temperatures, glacial chemistry as Sir John Evans styled it, and of the elements generally at extreme temperatures; and the other, the fact that the latitude of places upon the earth's surface does not appear to have an invariable value. With the former investigations the name of Professor Dewar is now especially associated. The latter work is mainly Transatlantic, and the chief investigator is Professor Chandler.

Liquid oxygen has been obtained in the following way by Dewar. The chamber containing the oxygen to be liquefied was surrounded by two casings. Into the spaces between these casings and between the oxygen chamber and the inner of the two, liquefied ethylene and liquefied nitrous oxide were introduced and evaporated, to pass to a compressor as a gas, and to be there recondensed and returned again to the casing space. The cycle of operations for each of these substances was generally similar to that employed in the case of refrigerating machines working with ether or ammonia.

The ethylene is obtained by the action of alcohol upon strong sulphuric acid; the H_2SO_4, which has a strong affinity for water, dehydrating the alcohol.

$$C_2H_6O = C_2H_4 + H_2O.$$
Alcohol. Ethylene.

Ethylene can be liquefied by pressure at any temperature below 9·2° C. Its boiling point is —136° C., and by evaporating the liquid after cooling, extremely low temperatures are obtainable.

In this way oxygen has been cooled below its critical temperature; that is to say, below the temperature above which it cannot be condensed by pressure. The critical temperature of oxygen is —112° C. At that temperature a pressure of fifty atmospheres is required to condense the gas. At —136°, the boiling point of ethylene, the pressure needed is only 20 atmospheres. At —182° it is only one atmosphere. In other words, the boiling point of oxygen is —182°.

In his demonstration at the Royal Institution last May, Professor Dewar exhibited to the audience a pint of liquid oxygen. The liquid was at first cloudy, the cloudiness being due to the presence of impurities. After filtering, the element was seen to be a clear transparent liquid of a slightly bluish tinge. By keeping the vessel containing the liquid in a glass receiver over mercury at a low temperature, the evaporation is lessened, and it is possible to examine with some precision the physical properties of the liquefied oxygen.

The latent heat of vaporization of the liquid is about 80 thermal units. Its capillarity at its boiling point was about one-sixth that of water.

When the liquid was interposed in the path of the rays from the electric light, it gave an absorption spectrum substantially similar to that of the gas. The lines A and B of the solar spectrum, due to oxygen of the earth's atmosphere, came out very strongly. Altogether the liquid and the highly compressed gas show a series of five absorption bands, situated in the orange, yellow, green, and blue respectively.

(The fact of the oxygen lines of the solar spectrum being atmospheric, we may note here, is enforced by the sustained observations of Dr. Janssen on Mt. Blanc. The oxygen lines disappear more and more as a greater altitude is attained, and as the thickness of air through which the sunlight has to pass diminishes. And at sunset and sunrise, when the suns rays pass obliquely through the air, they are seen more distinctly.)

The persistence of the absorption spectra of oxygen through all stages of its condensation, would seem to point to the fact that there are no essential alterations in its molecular constitution during these changes.

Liquid oxygen is a non-conductor of electricity. It is strongly magnetic, twice as much so as a solution of ferrous chloride, nearly five times as much so as air. Its specific magnetism is $\frac{1}{3000}$ that of iron. Placed on a cup of rock salt—which it does not wet—it remains in the spheroidal state, and if the cup and its oxygen be then placed between the poles of an electro magnet, the element will be lifted out of the cup and will connect the two poles. It will then proceed to boil away off the poles, and when the circuit is broken it drops back into the cup.

Previous to Professor Dewar's recent work the chief names in connexion with this question of the liquefaction of gases were those of Dr. Andrews, Cailletet, Pictet, Wroblewski, and Olzewski, so that Professor Dewar has recovered for this country in this line of investigation a supremacy it had lost.

Andrews investigated CO_2 chiefly, and was the discoverer of the *critical temperature*, that is, the temperature above which it is impossible to liquefy a gas. For carbon dioxide the temperature is 30·92°. Above this carbon dioxide tends to behave as a perfect gas, and at 48° it obeys Boyle's law (*i.e.*, volume inversely as pressure). A pressure of about 75 atmospheres liquefies this gas at the critical temperature. It is by observing the behaviour of the liquid inclusions in the minerals of rocks about this temperature that the liquid in many of them has been recognised as CO_2. At 31° the boundaries of the drop of liquid disappear and gas fills the cavity.

Cailletet compressed oxygen in a vessel surrounded by a freezing mixture. The pressure (of as much as 500 atmospheres) raised the temperature of the gas compressed. After this an interval was allowed to elapse during which this heat could radiate away from the apparatus. Then the screw of the press was suddenly released, and the pressure partially relieved. The gas expands, of course, and a great fall in temperature is the consequence of this expansion. In this way oxygen, nitric oxide, and marsh gas, were liquefied, but only in small quantities.

Pictet obtained oxygen by heating potassium chromate which passed into a strong tube, the pressure upon the oxygen being produced by its own disengagement. He surrounded the condenser by carbon dioxide, which was evaporated by pumping; this CO_2 being previously condensed and cooled by the evaporation of liquid SO_2.

Wroblewski and Olzewski were the first to employ liquid ethylene, and to obtain small quantities of liquid oxygen and air. It is an improvement of their method which has been employed by Professor Dewar.

Liquid air was obtained by Professor Dewar by the agency of the liquid oxygen above described. A temperature of below —200° is attainable by the evaporation of oxygen accelerated by a high expansion pump, and atmospheric air may then be liquefied in an open test tube at the ordinary atmospheric pressure.

Liquid air is a murky blue liquid, and on its boiling in a test tube nitrogen is first disengaged and then oxygen. This is shown by the familiar experiment of inserting a smouldering splinter into the test tube from which the gas is being disengaged. At first the splinter does not re-ignite, but after an interval the whole of the nitrogen has gone and the oxygen in its turn beginning to assume the gaseous state, the splinter bursts into flame.

Liquid air, like liquid oxygen, is a non-conductor of electricity, and both constituents of the mixture are magnetic.

By evaporating liquid air in a similar manner to the above evaporation of oxygen still lower degrees of temperature are possible, and the attainment of the critical temperature and the liquefaction of hydrogen is thus very possible, and probably indeed imminent.

Nitrogen has a critical temperature of —146°, and its boiling point is —194°. We are evidently thus approaching more and more nearly to the absolute zero of temperature, —273°. At that temperature no gas, it would appear, can exist.

We may here remind the reader who is not especially a student of chemistry of Guy-Lussac's law of the expansion of gases (= law of Charles.) The reader has probably met with the statement that liquids and even solids evaporate at *all* temperatures—*e.g.*, gradual disappearance of snow during a prolonged frost—and he may be imbued with the old conception that an absolute vacuum is a physical impossibility. As we go down the scale of temperature the proportion of evaporation, however, steadily diminishes. Guy-Lussac has shown that for every degree upward or downward a gas expands or contracts $\frac{1}{273}$ of its volume at 0° C. If we call its volume at 0° v, at 2° it will be $v + \frac{2v}{273}$, and at — 2 degrees, $v - \frac{2v}{273}$. Evidently, then, at — 273° all the heat, all the latent energy of its state, will have left the gas, and its volume would be nothing; that is to say, it cannot exist at that temperature as a gas even under no pressure at all.

At these low temperatures there is a remarkable diminution of the activity of chemical reactions. We seem to be approaching what has been styled the *Death of Matter*. All who have studied chemistry must be aware of the strong affinity of potassium, sodium, and phosphorus for oxygen. Potassium, for instance, tarnishes at once on exposure to air, and, on being thrown upon water, decomposes that compound, to become oxydised with such violence as to burst into flame. But both potassium and sodium will float unaltered upon liquid oxygen. At — 200° the molecules of oxygen have only one half of their ordinary velocity, and have lost three-fourths of their energy. Professor Dewar has even stated that at these low temperatures all chemical action ceases. This, however, requires some modification, since a photographic plate immersed in liquid oxygen was still sensitive to light at — 200° C. This is chemical action as a consequence of radiant energy. It would, however, appear to be correct to state that these temperatures, in the absence of extrinsic energy, matter display no chemical affinity.

Professor M'Kendrick, Professor Dewar stated in the conclusion of his lecture, had tried the effect of these low temperatures upon the spores of bacteria. Sealed glass tubes containing nutritive fluids were submitted to a temperature of — 182° for one hour, and subsequently kept at a warm temperature for several days. On being opened they were found to contain abundant bacteria living. Seeds also resisted an equally low temperature. This, he thinks, has proved the possibility of Lord Kelvin's suggestion that life first reached this earth upon a spore-carrying meteorite. At any rate, it shows that the complicated chemical compounds which make up living protoplasm, though their activity is probably absolutely suspended, are not destroyed by these extremes. Simply nothing happens until the temperature is raised.

The general tendency of all these enquiries is to point downwards to a physical condition at which all phenomena cease, through the withdrawal of all energy in the form of heat, from matter. And recent investigations into the temperature of the higher atmosphere, of which an account is given in the 'Honours Physiography' of the authors' now in the press, seems to show that the temperature of interstellar space cannot be far above this absolute zero—this death chill of all material things. It is in harmony with the apparent absence of friction in stellar movements to suppose that interplanetary space is without gas even of extreme tenuity.

It is interesting to turn from this question of excessively low temperatures towards the other extreme of the scale. Some singularly interesting suggestions with regard to high-temperature chemistry formed the bulk of the Presidential Address delivered by Professor Emerson Reynolds to the Chemical Section of the British Association on the thirteenth of this September.

As the student is probably aware, as we go upward in the scale of temperature we pass the melting points of an increasing number of bodies. Then we come to their boiling points. At the absolute zero of temperature—in the practical absence of energy, that is—we may conceive of all substances as solid. We may also imagine that a temperature in the upward scale may be attained at which all substances will be in the condition of gas. Moreover, gaseous *compounds* at high temperatures *dissociate*, that is, become resolved into their constituents. Ammonium chloride, for instance, breaks up into ammonia and hydrochloric acid, and these again at still higher temperatures into nitrogen, hydrogen, and chlorine. In the sun we have apparently only dissociated elements, and possibly those substances which have resisted all attempts at analysis under terrestrial conditions (iron, *e.g.*) may be resolved into simpler constituents.

Professor Emerson Reynolds took his hearers back to the time when our globe had no solid core, when the greater proportion of its mass must have been in the gaseous condition. The temperature must then have been far above the dissociating point of oxides or of carbon compounds.

He then proceeded to point out the many points of similarity between carbon and silicon, the agreement of physical properties of the uncombined elements, and the parallelism of their chief compounds. Both elements are tetradic, both are solids, with crystalline, graphitic, and amorphous forms; the hydrogen, sulphur, and halogen compounds are generally parallel, and quite recently nitrogen compounds of Si have been demonstrated equivalent to those of C.

He then went on to suggest that at that time silicon may have played the *rôle* of carbon, and aluminium that of nitrogen, in a great series of compounds comparable to the series of carbon compounds that form the subject matter of the organic chemistry of to-day. The endlessly varied silicates and aluminium silicates that form the bulk of our rocks are, he considered, the oxydised vestiges of that period of chemical activity.

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BY

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Member of the Royal Agricultural Society of England; First Class Honours and Bronze Medallist (No. 1 on List, 1883), Science and Art Department; First Class Certificate (Institute of Agriculture), South Kensington; Lecturer in Agriculture at the Polytechnic Institute, Regent Street, London, W.; the Polytechnic, Woolwich; the Y.M.C.A., Croydon; and late of the Evening Classes, School Board for London, &c.

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As temperature fell carbon came into play with increasing energy relative to the silicon compounds. The formation of a series of compounds of carbon, nitrogen, and hydrogen, and their subsequent oxydation, with its consequences, must be intimately connected with the phenomena of the beginnings and progress of life on the earth. All the silicon compounds have been oxydised, and the general tendency of vital activity is towards the oxydation of carbon compounds and the formation of carbon-dioxide.

These suggestions, taken together with the preceding results of Professor Dewar's investigations, will enable the student of physiography to form a general conception of the *history of the world, regarded from the chemical standpoint.* In the past we see a high level of energy—dissociated elements in a gaseous condition. From this state, as energy is radiated as heat into space, we come to the beginning of combination, and as the downward course continues, an increasing number of elements come into play, complex interchanges occur, and more stable and more inert unions become possible. And following the tendency further, we see in the future a continually diminishing violence of reaction, once incompatible compounds lying down side by side; a great peace, as it were, creeping over the struggle of chemical affinities, until at last, so far as the vision of science can pierce at present, we must come to the absolute zero and the final Death of Matter. This, at least, is what recent chemical enquiry makes the terrestrial prospect appear to be. We may anticipate that the earth and the other constituents of the solar system, their energy radiated away, will roll lifeless through space, until the impact of collision with other 'dark matter' shall disengage fresh energy, liquefy or change to gas all, or some, of the mass, dissociate some or all chemical compounds, and so start over again this cycle of downward chemical change.

Variation in Latitude.

The question of *variation in latitude* of places on the earth's surface, so far as extensive alterations are concerned, attracted a considerable amount of attention in the middle decades of this century, and in '76 and '77. Quite recently the question has come forward again for discussion, but now only so far as relatively minute variations are involved. An admirable summary of the whole question, by Professor Doolittle, appears in *Nature* for September 7th. It will be most convenient to begin by stating as briefly and as clearly as we can certain general considerations that affect this problem.

(i) If a rigid body is set rotating upon an axis passing through its centre of gravity or centre of inertia, and is unaffected by external forces it will continue to rotate around that axis for ever.

(ii) But if a rigid body is set rotating upon any other axis, there will be a revolution of this axis of rotation about the principal axis of inertia of the body.

Euler, more than a hundred years ago, investigated mathematically the condition of affairs with respect to rigid bodies, and it was applied by Oppolzer to the earth (assumed to be rigid). He found that the period of revolution should be 304·8 mean solar days, that is, that there should be a variation of latitude, of an amplitude commensurate with the angle between the two axes, having a period of this length. That angle is clearly very small, since observations were at first insufficient either to confirm or dispose of these conclusions.

(iii) It will be evident that any permanent change in the form of the rigid rotating body will affect the position of the axes of inertia and so introduce complications into this rotation. Such changes of form as those consequent upon the processes of subaërial denudation or volcanic upheaval are intended, which must permanently alter—if only to relatively very small extent—the position of the centre of inertia.

(iv) The centre of inertia may also be shifted periodically with variations of seasonal condition. A greater amount of moisture, for instance, may be transferred polewards from the tropics in either hemisphere during its summer than during its winter.

(v) If the body be no longer regarded as perfectly rigid, the conditions of Euler's problem are altered. Newcomb (1892) has shown how this alteration occurs. Let AB be the pole of figure of the terrestrial oblate spheroid and CD the axis of rotation at any particular moment. The action of centrifugal force will tend to make CD the shortest axis; in other words, AB will tend to approach CD, and will describe 'a sort of curve of pursuit' after it, as it rotates, and the period of rotation will be lengthened. The two axes will also continually tend more and more nearly to coincidence and the velocity of rotation to diminish.

Professor George Darwin has shown in his studies of the phenomena of nutation, precession, and the tides, that the earth is not perfectly rigid, but has a rigidity between that of steel and glass, so that these considerations weigh in the case of the earth.

(vi) If the influence of the mobility of the ocean is considered it will be found to have the same tendency as the elasticity of the earth as a whole.

From all these considerations one might anticipate—

(*a*) Slow, and, in human periods of time, practically imperceptible alterations of a permanent character, due to the waste of existing land surfaces and upheaval (iii).

(*b*) An annual variation in latitude, due to annual meteorological variations (iv).

(*c*) A cycle of variation of latitude of steadily diminishing magnitude due to the causes specified in (v) and (vi).

It was (*a*), *Secular Variation in Latitude*, that received attention in the discussion started by Sir John Lubbock in 1848, and which was reopened by Sir John Evans in 1876. Lord Kelvin considered the cause sufficient to account for changes of latitude even to the extent of 40° in past geological ages. Professor G. H. Darwin, however, in the following year, published calculations to show that if the earth be considered to be rigid, complete redistribution of land and sea, under the most favourable conditions, would cause a displacement of only 30°; with a certain measure of plasticity, however, this could be increased to 10° or even 15°. But since geologists seem to be arriving at something like unanimity in declaring the practical permanance of the great continental masses and ocean troughs, we are forced to conclude that the axis, so far as this cause goes, has been more or less nearly approximated to its present position for at least the vast period of time during which the Mesozoic and Tertiary rocks have been in course of formation.

Coming now to (*b*) and (*c*), the *Periodic Variation in Latitude*, the magnificent series of investigations conducted by Professor Chandler may very well be considered to the exclusion of the fragmentary observations that preceded his. Professor Chandler first examined several series of observations of relatively short duration, made by himself, Küstner, Gylden, Nyrén, and other observers. Subsequently a more elaborate analysis was resolved upon, and 45 different series, making a total of more than 33,000 observations between 1837 and 1891, were taken in hand. From this it was found that the velocity of revolution of the pole of rotation was in 1774, 348 days, and had diminished with increasing rapidity of diminution to 443.

Subsequently it was shown that the changing length of the period of rotation was due to the fact that there were really two cycles of variation, which as they coincided or conflicted, compounded to produce a longer or shorter resultant period. Professor Chandler distinguishes:

(A) An annual period.

(B) A 427-day period (the Chandlerian period).

We have already given speculative considerations affecting the causes of these periods. (A) we may assume is our period, (*a*), and (B) our period, (*c*) above. The observations are not sufficiently precise, nor do they extend over a sufficiently long time to determine whether the rotation (B) is undergoing a gradual reduction of amplitude and velocity such as the hypothesis of Newcomb requires.

The extreme importance of methods of precision in these investigations goes without saying. The instrument employed is the zenith telescope. The difference in zenith distance of two stars having culminating points, one north and one south of the zenith, is observed. The error creeps in mainly in the unreliability of the level. To eliminate this a floating zenith telescope has been invented by Fathers Hagan and Fargie. The instrument floats on a trough of mercury, and the star is recorded on a photographic plate as it crosses the field.

All these variations of latitude we have considered thus far affect the earth as a whole, and are due to the alterations in the axis of rotation. Besides these, it seems highly probable that there are small *Local Variations in Latitude* due to purely local causes.

The nature of these will be understood if we consider the phenomena of the folding of geological strata. Clearly, where strata originally horizontal have been thrown into anticlinal and synclinal folds, points originally separated by the length of the arc of these curves will now be separated by the distance only of the chord. And the splendid speculations of Reyer (of which an account will be found in the Honours Physiography of the writers) upon the origin of mountain folds, will help the student to understand still more clearly how such lateral movements of localities may arise. But save some rather dubious results, there is really no direct evidence that such permanent local changes occur. Precise and systematic observations in this matter, however, as yet do not extend back for more than a few score years, so that the absence of this proof has, by itself, no great weight against the obvious suggestions of the phenomena of mountain crumpling.

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I. *The Vascular System.*

1. As an introduction the reader is advised to peruse Chapter VII. Hughes's 'Elements of Human Physiology.' Commencing at the right auricle, the venous blood enters the right ventricle, and thence passes through the pulmonary arteries into the lungs, where it loses carbonic acid and takes up oxygen. Thence it passes to the left auricle by the pulmonary veins. Entering the left ventricle it is driven into the aorta and the arteries of the body generally. Traversing the capillaries the blood then finds its way into the veins, entering larger and larger trunks until finally the whole of the venous blood reaches the superior and inferior venæ cavæ, which pour their contents into the right auricle, from which cavity we started.

2. A historical survey of the growth of this knowledge is instructive. *Galen* (a Roman physician, born 130 A. D.) knew the distinction between arteries and veins; that both contained blood, and that the blood in the former was red. He proved also that the blood moved. He imagined that the blood within the arteries contained a large quantity of animal spirits (pneuma), that the heart was the centre of everything, and by means of the arteries the spirits were distributed to the nobler and finer organs, while the veins, containing darker blood, carried blood to the inferior organs. Shakespeare refers to this belief when he says, 'Too much plodding emprisons the nimble spirits within the arteries.' *Galen* was entirely ignorant of the part played by oxygen in the lungs; he believed air was inhaled to keep the blood cool. He thought the blood traversed invisible and imaginary passages in the septum, to reach the other side of the heart. This idea persisted up to *Harvey's* time, although *Vesalius* (born 1514) examined the septum between the ventricles carefully, and failed to detect any such communications. *Fabricius* (born 1537) described the valves in the veins, but was unable to see any usefulness in them. *Cæsalpinus*, in 1560, hazarded the suggestion that the veins *might* carry blood *towards* the heart and *not* to the organs, as had been previously taught.

3. Some difficulties had therefore been cleared up before *Harvey* undertook the investigation. He was born in 1578, and at the age of 50 published his celebrated book entitled 'De motu cordis et sanguinis.' In Chap. VII. 'Elements of Human Physiology,' a brief resumé is given of *Harvey's* work, to which the reader is referred.

4. *The minute Anatomy of the Heart.* The muscular fibres of the heart resemble those of the striped muscle in the possession of striæ, but they possess no sarcolemma (paragraph 48, 'Elements of Human Physiology'). These fibres consist of small, branched cells about $\frac{1}{400}''$ long, possessing an oval nucleus. The cells are held together by means of a cementing material, which may be dissolved by a solution of potash or dilute nitric acid.

5. The *arrangement* of the muscular bundles is complicated. In the first place, those of the auricles are quite distinct from those of the ventricles. At no place do fibres pass over from one to the other. Over the auricles is a superficial circular layer of muscle, which runs around both. The two auricles consequently contract simultaneously. Each auricle has also a deeper layer of muscle arranged longitudinally.

6. In the auriculo-ventricular groove lies a mass of connective tissue in the form of a ring, partly cartilaginous and sending prolongations to the orifices, which serve to strengthen them. In the ventricles the superficial fibres pass obliquely downwards and outwards from right to left, and twisting around the apex, turn upwards and become continuous with the papillary muscles in the left ventricle. The middle fibres of the thickness of the ventricles are almost annular and transverse. The connection and arrangement of the ventricular fibres explain the simultaneous contractions of both ventricles, and the twisting of the apex from left to right, which occurs at the moment of contraction.

7. The heart is supplied by nerves from the sympathetic system and the two vagi. These unite to form an intricate plexus below the arch of the aorta, and from these nerve fibres pass into the substance of the heart itself. Ganglion cells (page 49, 'Elements of Physiology') occur plentifully in the auriculo-ventricular groove. Some of the nerve fibres are large and medullated, others are very fine. Of the latter some are medullated, others non-medullated, that is, they do not possess a medullated sheath.

QUERY COLUMN.

Yorks.—A hare pursued by a greyhound is 60 of her own leaps ahead. The hare leaps half as fast again as the hound, but the latter's leap is $\frac{7}{8}$ that of the hare. In how many leaps will the hound catch the hare?

Greyhound takes 2 of his leaps whilst the hare takes 3 of her leaps.

Greyhound takes $2 \times \frac{7}{8}$ or $1\frac{3}{4}$ of the hare's leaps whilst the hare takes 3 of her leaps.

$\therefore$ Greyhound gains $1\frac{3}{4} - 3$ or $\frac{5}{4}$ of the hare's leaps in 2 of his leaps.

Greyhound gains $\frac{5}{8}$ of a hare's leap in one of his leaps.

$\therefore$ No. of leaps of the hound to catch the hare $= 60 \div \frac{5}{8}$

$= 72$. Ans.

REVIEWS.

Illustrations of Flags and Arms of the United Kingdom. No. 4: the Royal Arms. Edinburgh and London: W. and A. K. Johnston.

This nicely-printed and brightly emblazoned wall-sheet depicts the 'Royal Arms, Supporters, Badges, &c. (Reign of Queen Victoria),' and although the information given may from a practical point of view be not of a very necessary or important character, the Royal Arms form a sufficiently 'common object of the country' to make the spread of information thereon acceptable and commendable. In the letterpress appended to the plate the main features of the arms are described carefully and clearly, and the references therein to lions rampant and lions passant, to lions statant and lions sejant, to say nothing of 'double tressures' and unicorns 'unguled Or,' serve to give the appropriate heraldic spice without which the description would be 'flat, stale, and unprofitable.'

Illustrations of Trades: Brewing. Edinburgh and London: W. and A. K. Johnston.

Whatever may be one's opinion with respect to the brewing trade, there is no doubt that, commercially speaking, it is one of the most important in the kingdom, and as such is deserving of a place in any series of wall-sheets illustrative of national industries. The wall-sheet now before us shows in a series of eight pictures what may be described as the 'Life-History of Beer,' from the mill wherein the malt is crushed to the bottling and packing department. From an educational point of view the illustrations leave little to be desired, although perhaps not quite up to the standard of previous plates in the same series. From a temperance point of view it might be urged that the sheet would be rendered more complete if the history of beer were carried a step or two further than the packing department. A picture illustrative of what is euphemistically called 'booze' and of its consequences might perhaps with some reason be suggested as a completion, whilst to make the lesson to be learned from the plate the more emphatic the tableaux might perhaps commence with a view of the healthy sunshiny cornfields in which, in an innocent guileless way, John Barleycorn commences his career.

From Messrs. Blackie & Co. we have received the usual intimation as to the results of the last 'Vere Foster Writing and Drawing Competition,' together with details concerning that of the forthcoming year. The results are most satisfactory, attesting as they do the continued popularity of these old and well-tried Copy and Drawing Books. Messrs. Blackie will send full particulars to any teachers or scholars who may wish to look into the system, and the numerous appreciative notices which are quoted certainly indicate that the said system will bear scrutiny. It has been our pleasant duty to call attention to this competition in many previous years, and we trust that continued success may cause this duty to devolve upon us for many succeeding years.

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Presented with the October Number of the 'PRACTICAL TEACHER.'

GRADED TEST CARDS.

Prepared by T. W. BERRY, Head Master, Christ Church School, Stone, Staffs.

STANDARD IV.

Containing 900 Sums.

Mechanical side contains examples in every Rule, arranged so that each Rule is numbered alike throughout the pack. This is of special importance, as the Cards lend themselves for black-board instruction—thus, a lesson on Multiplication is followed by all working Sum 1, and similarly on Square Measure all work No. 16, &c.

The Mechanical Sums will cultivate accuracy—the Tests, intelligence.

TEST CARDS.

Card 1.

1. Multiply £17 9s. 4½d. by 56.
2. £317 13s. 4½d. × 309.
3. £12 3s. 0¼d. ÷ 9.
4. £1416 17s. 4½d. ÷ 19.
5. £131,004 7s. 6½d. ÷ 291.
6. Bring £3 4s. 6½d. to farthings.
7. How many £ s. d. are there in 3198 farthings?
8. Reduce 2 qrs. 7 bus. 3 pks. 1 gall. 1 qt. to pints.
9. Bring 4620 pints to quarters, etc.
10. Reduce 3 yrs. 5 mths. 2 wks. 6 days to mins.
11. Bring 1,136,160 minutes to years (months, etc.).
12. Reduce 3 tons 5 cwt. 2 qrs. 13 lbs. to ozs.
13. Bring 3,123,041 drams to tons.
14. Reduce 1 mile 3 fur. 20 pole 4 yds. to feet.
15. Bring 141,000 inches to miles.
16. Reduce 3 rd. 15 pl. 8 yds. to sq. inches.
17. How many square poles, etc., are there in 1,061,431 sq. inches?

Card 2.

1. Multiply £31 1s. 3½d. by 64.
2. £568 14s. 9¼d. × 516.
3. £2 5s. 6½d. ÷ 11.
4. £3000 1s. 2¼d. ÷ 17.
5. £806,091 17s. 4½d. ÷ 316.
6. Bring £4 5s. 10¼d. to farthings.
7. How many £ s. d. are there in 4,116 farthings?
8. Reduce 1 qr. 6 bus. 2 pks. 1 gall. to pints.
9. Bring 7,041 pints to quarters, etc.
10. Reduce 1 yr. 3 mths. 2 wks. 10 hrs. to minutes.
11. Bring 2,104,356 minutes to years (months, etc.).
12. Reduce 15 tons 13 cwt. 1 qr. to ozs.
13. Bring 1,234,156 drams to tons.
14. Reduce 4 miles 3 fur. 15 poles 2 feet to feet.
15. Bring 131,006 inches to miles.
16. Reduce 14 sq. poles 7 yds. 2 feet 18 inches to sq. inches.
17. How many sq. roods, etc., are there in 3,076,061 sq. inches?

EXAMINATION TESTS.

Card 1.

Boys.

1. A man spends 3s. 4d. a week and also pays 6s. 6d. a day for lodgings and saves 5 guineas a quarter: what is his yearly income?
2. Divide £513 11s. 7½d. by 37.
3. How many acres, roods, etc., are there in one hundred and fifty-six thousand six hundred and fifteen square feet?
4. Find the sum of 15 guineas, 30 half-crowns, 172 three-halfpennies, 2,016 pence, and 3,000 farthings.

Girls.

1. How much money should I spend in 15 years if I spent 2s. 6½d. a day? (365 days = 1 year.)
2. How many ounce-packets could be made from a cask containing 3 cwt. 2 qr. 1 st. 11 lbs.?
3. Multiply £316 9s. 4¼d. by 3,016.
4. Divide one thousand four hundred and sixteen pounds seventeen shillings and fourpence halfpenny by 19.

Card 2.

Boys.

1. Multiply two hundred and seventeen pounds three shillings and three halfpence by ninety-seven.
2. With forty-nine pounds nineteen shillings and ten pence halfpenny, to how many men could I give seventeen shillings and sixpence halfpenny?
3. Divide £16,041 0s. 4¼d. by 324.
4. Reduce five hundred thousand and forty inches to miles, furlongs, chains, etc.

Girls.

1. Divide thirty thousand and forty pounds and eleven pence three farthings by nineteen.
2. Reduce 15 tons 13 cwt. 1 st. 7 lbs. to ounces.
3. How much more than 50 guineas should I require to enable me to pay 84 men 14s. 3½d. each?
4. Multiply four hundred and twenty-one pounds three shillings and a halfpenny by seven hundred and sixty.

TEST CARDS—*cont.*

Card 3.

1. Multiply £48 11s. 7½d. by 81.
2. £712 15s. 0½d. × 217.
3. £3 8s. 9¼d. ÷ 8.
4. £1593 8s. 10¼d. ÷ 16.
5. £150,006 11s. 1½d. ÷ 518.
6. Bring £5 12s. 6¾d. to farthings.
7. How many £ s. d. are there in 4,665 farthings?
8. Reduce 5 qrs. 1 bus. 3 pks. 1 gall. 3 qts. to pints.
9. Bring 10,060 pints to quarters, etc.
10. Reduce 2 yrs. 5 mths. 5 dys. 15 mins. to mins.
11. Bring 3,800,604 minutes to years (months, etc.).
12. Reduce 7 tons 1 cwt. 2 qrs. 1 lb. to ozs.
13. Bring 1,936,014 drams to tons.
14. Reduce 7 fur. 13 poles 1 foot to feet.
15. Bring 560,142 inches to miles.
16. Reduce 1 rood 5 yds. 3 ft. 7 in. to sq. inches.
17. How many acres are there in 12,146,008 sq. inches?

Card 4.

1. Multiply £61 12s. 1¼d. by 63.
2. £153 11s. 2¼d. × 176.
3. £6 7s. 4¾d. ÷ 7.
4. £3215 19s. ÷ 23.
5. £316,174 1s. 0¼d. ÷ 236.
6. Bring £8 9s. 10½d. to farthings.
7. How many £ s. d. are there in 5,335 farthings?
8. Reduce 6 qrs. 6 bus. 2 pks. 3 qts. to pints.
9. Bring 7,349 pints to quarters, etc.
10. Reduce 1 year 4 mths. 3 wks. 10 mins. to minutes.
11. Bring 5,123,006 minutes to years (months, etc.).
12. Reduce 9 tons 16 cwt. 2 qrs. 3 lb. to ozs.
13. Bring 2,448,012 drams to tons.
14. Reduce 1 mile 30 pls. 1 yd. 2 feet to feet.
15. Bring 50,614 feet to miles.
16. Reduce 1 rood 10 pls. 2 yds. 1 ft. to square inches.
17. How many square roods are there in 4,000,601 square inches?

Card 5.

1. Multiply £12 4s. 8½d. by 25.
2. £713 13s. 7½d. × 419.
3. £4 1s. 9d. ÷ 5.
4. £7,658 0s. 9½d. ÷ 13.
5. £187,196 11s. 1¾d. ÷ 506.
6. Bring £3 3s. 7¼d. to farthings.
7. How many £ s. d. are there in 16,345 farthings?
8. Reduce 5 qrs. 3 bus. 1 pk. 1 gall. 1 pt. to pints.
9. Bring 7,090 pints to quarters, etc.
10. Reduce 2 yrs. 3 mths. 1 wk. 2 days to minutes.
11. Bring 1,816,030 minutes to years (months, etc.).
12. Reduce 11 tons 15 cwt. 1 qr. 2 lb. to ozs.
13. Bring 2,060,141 drams to tons.
14. Reduce 7 fur. 15 pls. 2 yds. 1 ft. to feet.
15. Bring 316,985 inches to miles.
16. Reduce 3 acs. 2 rds. 5 pls. 1 yd. to sq. ft.
17. How many square roods are there in 3,141,708 square inches?

EXAMINATION TESTS—*cont.*

Card 3.

Boys.

1. Bring three hundred and fourteen thousand and eighteen inches to miles, furlongs, chains, etc.
2. Divide one million and seventy-five pounds two shillings and sixpence farthing by three thousand and seventeen.
3. Into how many bags, each containing 11s. 9¼d., could I divide £29 16s. 9¼d.?
4. How much is one hundred and nineteen times three hundred and sixty pounds and eleven pence farthing?

Girls.

1. A boy had lived 79,683 hours: what age was he? (365 days = 1 year.)
2. Multiply £29 13s. 2¼d. by 3,017.
3. Divide five thousand and fourteen pounds one shilling and three farthings by 264.
4. What do I gain by selling 313 articles at 3s. 4½d. each, having paid £47 13s. 2d. for them?

Card 4.

Boys.

1. Reduce 13 ac. 3 rds. 13 pls. 2 yds. to square inches.
2. Multiply five hundred and three pounds sixteen shillings and four pence farthing by 98.
3. Divide two hundred and sixteen thousand pounds four shillings and eight pence by 17.
4. A chest of tea containing 3 stones 7 lbs. 6 ozs. is sold for £4 18s. 9d.; how much is that per ounce?

Girls.

1. What sum of money multiplied by 18 will produce £60 12s. 4½d.?
2. How many quarters, etc., are there in twelve thousand and sixty-four pints?
3. £10,641 17s. 9¼d. ÷ 361.
4. If each child in a class of 35 girls earns 2½d. a day how much will the whole class earn in a year? (365 days = a year.)

Card 5.

Boys.

1. How much change should I receive out of 150 guineas after paying 37 men £2 3s. 6½d. each?
2. Multiply one hundred and seventy-six pounds three shillings and fourpence farthing by three thousand and sixty.
3. How many weeks are there in one million three hundred and sixteen thousand and forty seconds?
4. £1,614 15s. 6¼d. ÷ 19.

Girls.

1. Multiply ninety-six pounds fifteen shillings and twopence farthing by 315.
2. How many people paying three pence each were there at a concert at which one thousand eight hundred and sixteen half-crowns were taken?
3. How many miles, furlongs, poles, etc., are there in nine millions and four thousand and sixty inches?
4. Divide three thousand seven hundred pounds seventeen shillings and twopence halfpenny by sixteen.

TEST CARDS—*cont.*

Card 6.

1. Multiply £96 3s. 9¼d. by 36.
2. 847 11s. 1¾d. × 621.
3. £5 6s. 8d. ÷ 6.
4. £7,008 12s. 1d. ÷ 27.
5. 268,397 0s. 0¼d. ÷ 216.
6. Bring £10 2s. 0¾d. to farthings.
7. How many £ s. d. are there in 7,834 farthings?
8. Reduce 7 qrs. 4 bus. 2 pks. 1 gall. to pints.
9. Bring 3,061 pints to quarters, etc.
10. Reduce 2 yrs. 2 mths. 1 wk. 5 hrs. to minutes.
11. Bring 3,090,146 minutes to years (months, etc.).
12. Reduce 14 tons 2 cwts. 2 qrs. 4 lbs. to ozs.
13. Bring 1,009,415 drams to tons.
14. Reduce 1 mile 2 fur. 3 yds. to inches.
15. Bring 254,060 inches to miles.
16. Reduce 1 ac. 15 pls. 7 ft. to sq. inches.
17. How many acres are there in 9,006,060 sq. inches?

Card 7.

1. Multiply £27 17s. 11¾d. by 24.
2. £158 2s. 11¼d. × 739.
3. £2 7s. 3½d. ÷ 12.
4. £6,307 11s. 10¾d. ÷ 15.
5. £917,614 2s. 1½d. ÷ 119.
6. Bring £6 7s. 1¾d. to farthings.
7. How many £ s. d. are there in 9,215 farthings?
8. Reduce 8 qrs. 5 bus. 1 pk. 1 qt. to pints.
9. Bring 6,890 pints to quarters, etc.
10. Reduce 1 yr. 2 mths. 1 wk. 3 days to minutes.
11. Bring 2,001,006 minutes to years (months, etc.).
12. Reduce 16 tons 19 cwts. 3 qrs. 5 lbs. to ozs.
13. Bring 5,310,006 drams to tons.
14. Reduce 2 miles 30 pls. 3 yds. to inches.
15. Bring 316,021 inches to miles.
16. Reduce 2 rds. 9 pls. 3 yds. 1 ft. to sq. feet.
17. How many acres are there in 861,403 sq. feet?

Card 8.

1. Multiply £83 2s. 7¼d. by 32.
2. £269 4s. 10¾d. × 801.
3. £1 9s. 4¼d. ÷ 5.
4. £5,612 13s. 2½d. ÷ 32.
5. 153,478 1s. 9d. ÷ 516.
6. Bring £1 3s. 0¼d. to farthings.
7. How many £ s. d. are there in 1,706 farthings?
8. Reduce 9 qrs. 6 bus. 2 pks. 1 gall. to pints.
9. Bring 17,006 pints to quarters.
10. Reduce 1 yr. 1 mth. 1 wk. 15 hours to minutes.
11. Bring 5,632,104 minutes to years (months, etc.).
12. Reduce 20 tons 14 cwts. 1 qr. 7 lbs. to ozs.
13. Bring 4,201,010 drams to tons.
14. Reduce 7 fur. 3 pls. 2 ft. to inches.
15. Bring 179,314 inches to miles.
16. Reduce 1 ac. 1 rd. 35 pls. 18 yds. to sq. ft.
17. How many sq. roods are there in 3,156,091 sq. inches?

EXAMINATION TESTS—*cont.*

Card 6.

Boys.

1. How many half-crowns are there in one hundred and seventeen and a half guineas?
2. £92 14s. 8d½. × 397.
3. Reduce a quarter of a million pints to bushels.
4. Out of 3 casks weighing one-and-half stones each, how many two-ounce packets can I make up?

Girls.

1. How many guineas are there in one hundred and fourteen thousand one hundred and thirty-one three halfpence?
2. Find the eighth part of one thousand two hundred and nine pounds six shillings and tenpence.
3. Reduce 14 ac. 2 rds. 28 yds. to square yards.
4. I have 2 half-sovereigns, 3 crowns, 7 half-crowns, 5 florins, 9 threepences; to how many girls could I give 1s. 6½d. each?

Card 7.

Boys.

1. How many times must I add 3s. 4½d. to itself to make the sum of £16 10s. 9d.?
2. Bring two hundred and one thousand and sixty square feet to acres, etc.
3. £401,682 13s. 6¾d. ÷ 218.
4. What is the value of seventy-nine houses, if one is worth three hundred and six pounds two shillings and eleven pence?

Girls.

1. How many steps of 2 ft. 3 in. shall I take in walking 12 miles 6 fur. 32 pls. 4 yds. 2 ft. 3 in.?
2. Find the difference between 43,016 halfpence and 716 half-crowns.
3. £12 18s. 1¾d. × 576.
4. Divide three hundred and sixteen pounds five shillings and eight pence farthing by one hundred and ninety-two.

Card 8.

Boys.

1. Out of 50 guineas I pay 14 men £3 1s. 4¼d. each; what change should I have?
2. What is the eighty-ninth part of one hundred and fifty-six pounds seventeen shillings and three pence?
3. How many quarters, etc., are there in half a million pints?
4. How many eight-pences are there in 314 guineas?

Girls.

1. Multiply £36 17s. 9½d. by 85.
2. How much money should I have left after dividing three thousand and sixty-seven pounds eleven shillings and fourpence farthing by three hundred and sixteen?
3. How many inches are there in 15,641 chains?
4. A dealer gains £64 15s. on selling 1 ton 3 cwt. 14 lbs. of tea at 2s. 6d. per lb.; how much per lb. did he pay for it?

TEST CARDS—*cont.*

Card 9.

1. Multiply £34 13s. 2½d. by 77.
2. £312 19s. 8d. × 945.
3. £8 8s. 1¼d. ÷ 4.
4. £7,016 17s. 6¼d. ÷ 41.
5. £200,006 17s. 1½d. ÷ 610.
6. Bring £2 4s. 2¼d. to farthings.
7. How many £ s. d. are there in 2,993 farthings?
8. Reduce 10 qrs. 7 bus. 3 pks. 1 gall. to pints.
9. Bring 15,106 pints to quarters.
10. Reduce 4 years 10 mths. 1 wk. 15 minutes to minutes.
11. Bring 7,030,156 minutes to years (months, etc.).
12. Reduce 25 tons 3 cwt. 2 qrs. 6 lbs. to ozs.
13. Bring 1,600,512 drams to tons.
14. Reduce 6 fur. 4¾ yds. 2 feet to inches.
15. Bring 123,456 inches to miles.
16. Reduce 2 roods 29 yds. 1 foot to sq. inches.
17. How many acres are there in 326,001 square feet?

Card 10.

1. Multiply £73 4s. 3¼d. by 96.
2. £172 2s. 1¼d. × 127.
3. £7 9s. 2d. ÷ 10.
4. £1,205 16s. 9d. ÷ 52.
5. £897,643 2s. 0d. ÷ 171.
6. Bring £5 7s. 1¼d. to farthings.
7. How many £ s. d. are there in 4,949 farthings?
8. Reduce 11 qrs. 1 pk. 1 qt. to pints.
9. Bring 5,100 pints to quarters, etc.
10. Reduce 2 yrs. 2 mths. 3 wks. to minutes.
11. Bring 8,156,004 minutes to years (months).
12. Reduce 19 tons 13 cwt. 3 qrs. 8 lbs. to ozs.
13. Bring 5,104,231 drams to tons.
14. Reduce 1 mile 3 poles 2 feet to inches.
15. Bring 317,060 inches to miles.
16. Reduce 3 ac. 13 poles 89 inches to square inches.
17. How many acres are there in 7,169,312 square inches?

Card 11.

1. Multiply £64 9s. 5½d. by 54.
2. £493 6s. 2½d. × 314.
3. £4 7s. 6d. ÷ 8.
4. £2,323 8s. 2½d. ÷ 73.
5. £315,171 0s. 11¼d. ÷ 409.
6. Bring £6 9s. 1¼d. to farthings.
7. How many £ s. d. are there in 5,962 farthings?
8. Reduce 17 qrs. 1 bus. 2 pk. 1 gall. to pints.
9. Bring 3,010 pints to quarters, etc.
10. Reduce 1 year 2 mths. 1 wk. 35 min. to minutes.
11. Bring 1,101,006 minutes to years (months, etc.).
12. Reduce 18 tons 12 cwt. 1 qr. 7 lbs. to ozs.
13. Bring 1,234,067 drams to tons.
14. Reduce 6 fur. 4¼ yds. 2 feet to inches.
15. Bring 416,908 inches to miles.
16. Reduce 3 roods 11 poles 30 yds. 2 feet to square feet.
17. How roods are there in 2,169,147 square inches?

EXAMINATION TESTS—*cont.*

Card 9.

Boys.

1. A penny postage-stamp is half a square inch. How much would it cost to cover a rood with such stamps?
2. Find $\frac{1}{25}$ part of £951 13s. 2¼d.
3. What is 314 times £15 19s. 2¼d.?
4. How many tons etc. are there in two hundred and six thousand and nine half-pounds?

Girls.

1. How much short of twenty thousand pounds is 216 times £87 5s. 6½d.?
2. Divide three thousand and sixty-seven pounds eleven shillings and four pence farthing by three hundred and sixteen.
3. How many tons, cwts., etc. are there in two hundred and one thousand and sixteen stones?
4. A man sells 30 cows at £18 19s. 4½d. each.; he spends 1s. 3d., and with the remainder buys 8 horses. What price did he pay per horse?

Card 10.

Boys.

1. What sum of money multiplied by 419 will equal £5,123 2s. 11½d.?
2. I buy one thousand eight hundred and seventy-two eggs at the rate of 3 half-crowns for a gross, and sell them at 3 for 2d. What do I gain altogether?
3. Bring three hundred thousand and nineteen three-halfpences to £ s. d.
4. How many square inches are there in 29 sq. yds. 7 sq. ft. and 132 sq. inches?

Girls.

1. By how much does two hundred and fifty-six pounds three shillings *exceed* one hundred and ninety-eight pounds seven shillings and eleven pence farthing?
2. How many more three-pences are there in 529 guineas than £530 1s. 9d.?
3. What is the seventh part of £106 3s. 7½d.?
4. How many years of 365 days are there in ninety-one millions and seven thousand and forty-two seconds?

Card 11.

Boys.

1. What is a 216th part of eighteen thousand eight hundred and fifty-one pounds seventeen shillings?
2. How often is 3 yds. 2 ft. 7 ins. contained in 15 pls. 1½ yds. 2 ft. 10 ins.?
3. Multiply seventeen pounds seventeen shillings and eight pence farthing by three hundred and fifty.
4. Reduce 3 tons 2 cwt. 3 st. to ounces.

Girls.

1. How many chains are there in 8 miles 3 fur. 16 pls.?
2. How many ninepences are there in £315 2s. 3d.?
3. Find the number of seconds in January.
4. Divide three hundred thousand and eight pounds five shillings and two pence by three hundred and nineteen.

TEST CARDS—*cont.*

Card 12.

1. Multiply £52 8s. 6¼d. by 72.
2. £289 3s. 3¾d. × 568.
3. £11 13s. 10 ÷ 7.
4. £3,032 15s. 5d. ÷ 14.
5. £684,135 1s. 0d. ÷ 570.
6. Bring £8 1s. 2½d. to farthings.
7. How many £ s. d. are there in 6,975 farthings?
8. Reduce 18 qrs. 2 bus. 3 pks. 1 qt. to pints.
9. Bring 3,060 pints to quarters, etc.
10. Reduce 1 year 1 wk. 6 days 11 hours to minutes.
11. Bring 3,200,456 minutes to years (months, etc).
12. Reduce 7 tons 4 cwt. 1 qr. 9 lbs. to ozs.
13. Bring 1,614,237 drams to tons.
14. Reduce 1 mile 30 poles 2 feet to feet.
15. Bring 105,314 inches to miles.
16. Reduce 1 ac. 3 poles 8 yds. to sq. feet.
17. How many acres are there in 365,149 square feet?

Card 13.

1. Multiply £40 7s. 7¾d. by 84.
2. £568 8s. 4½d. × 701.
3. £2 11s. 7d. ÷ 3.
4. £8,401 7s. 8¾d. ÷ 81.
5. £706,268 3s. 1d. ÷ 924.
6. Bring £10 13s. 0½d. to farthings.
7. How many £ s. d. are there in 7,988 farthings?
8. Reduce 24 qrs. 3 bus. 2 pks. 1 gall. to pints.
9. Bring 13,760 pints to quarters, etc.
10. Reduce 1 yr. 9 months 6 days 59 min. to minutes.
11. Bring 7,090,317 minutes to years (months).
12. Reduce 14 tons 11 cwt. 2 qrs. 10 lbs. to ozs.
13. Bring 914,060 drams to tons.
14. Reduce 1 mile 2 fur. 28 poles 1¼ yds. to feet.
15. Bring 216,001 inches to miles.
16. Reduce 4 ac. 1 rd. 15 poles 8 yds. to sq. yds.
17. How many acres are there in 196,081 square feet?

Card 14.

1. Multiply £16 6s. 8¼d. by 60.
2. £357 10s. 5¼d. × 225.
3. £3 12s. 1d. ÷ 7.
4. £9,549 14s. 1¼d ÷ 25.
5. £927,493 4s. 5¼d. ÷ 160.
6. Bring £12 15s. 3¾d. to farthings.
7. How many £ s. d. are there in 9,097 farthings?
8. Reduce 4 qrs. 4 bus. 1 pk. 1 qt. to pints.
9. Bring 7,000 pints to quarters, etc.
10. Reduce 5 yrs. 1 month 1 wk. 1 day to minutes.
11. Bring 8,641,375 minutes to years (months, etc.).
12. Reduce 19 tons 10 cwt. 2 qrs. 10 lbs. to ozs.
13. Bring 876,123 drams to tons.
14. Reduce 3 fur. 15 poles 2½ yds. 1 foot to inches.
15. Bring 981,376 inches to miles.
16. Reduce 2 ac. 3 rds. 11 poles 5 yds. to sq. feet.
17. How many acres are there in 906,415 sq. yards?

EXAMINATION TESTS—*cont.*

Card 12.

Boys.

1. How much does the sum of eleven thousand three hundred and ten sixpences and eighty-one guineas *exceed* one thousand one hundred and sixty crowns?
2. Reduce 3 qrs. 7 bus. 2 gall. to half-pints.
3. How many pounds of tea at 2s. 2½d. per lb. could I purchase with £3 4s. 0½d.?
4. Multiply ninety-eight pounds two shillings and four pence farthing by seventy-two.

Girls.

1. How many stones should I require to add to 2,142 lbs. of sugar to make a ton?
2. Divide thirty-three pounds fourteen shillings and ten pence three farthings equally amongst eleven girls.
3. How many guineas are there in four thousand one hundred and four seven pences?
4. Multiply one hundred and fourteen pounds sixteen shillings and a farthing by one hundred and eighteen.

Card 13.

Boys.

1. How many half-guineas are there in one million one hundred and thirty-five thousand and eight pennies?
2. Divide thirty thousand and forty pounds and three half-pence by one hundred and twenty-nine.
3. If a man smokes half-an-ounce of tobacco a day, how much money does he thus spend in a year of 365 days, his tobacco costing him 4d. an ounce?
4. Reduce twenty-two hundred and four chains to inches.

Girls.

1. A butcher bought 9 sheep, each weighing 90 pounds, at £2 3s. 8½d. each, and sold them at 6¼d. per lb.; what did he gain altogether?
2. Multiply thirty-nine pounds sixteen shillings and four pence farthing by three thousand and six.
3. Divide fifty thousand pounds by nineteen.
4. Reduce 3 tons 15 cwt. 1 qr. to half-pounds.

Card 14.

Boys.

1. A man saves 3 guineas a quarter and spends £2 7s. 6d. per week; what is his yearly income?
2. Divide two hundred thousand and fourteen pound seven shillings and eight pence half-penny by two thousand and forty-one.
3. How many square yards are there in two square miles?
4. How much must be added to £36 8s. 6¼d. to make 89 half-guineas?

Girls.

1. How many three-penny-pieces must be added to 18 sixpences to make 10s.?
2. Reduce 3 miles 15 poles 2 feet to inches.
3. Multiply thirty-three pounds eighteen shillings and nine pence three farthings by two hundred and sixty.
4. Find a sixteenth part of fifty one pounds seven shillings.

TEST CARDS—*cont.*

Card 15.

1. Multiply £55 8s. 9¾d. by 40.
2. £645 5s. 6d. × 214.
3. £4 10s. 2d ÷ 9.
4. £2,608 6s. 4d. ÷ 53.
5. £158,715 6s. 7½d. ÷ 857.
6. Bring £4 17s. 9¾d. to farthings.
7. How many £ s. d. are there in 9,666 farthings?
8. Reduce 5 qrs. 5 bus. 2 pks. 1 gall. to pints.
9. Bring 2,714 pints to quarters, etc.
10. Reduce 6 years 2 mths. 1 wk. 1 day to minutes.
11. Bring 2,206,104 minutes to years (months).
12. Reduce 13 tons 9 cwt. 3 qrs. 9 lbs. to ozs.
13. Bring 900,314 drams to tons.
14. Reduce 6 miles 3 fur. 15 poles 2 yds. to yards.
15. Bring 700,601 inches to miles.
16. Reduce 6 miles 3 ac. 2 roods to sq. poles.
17. How many roods are there in 11,061,092 sq. inches?

Card 16.

1. Multiply £27 9s. 6¾d. by 30.
2. £836 9s. 7d. × 325.
3. £5 13s. 8d. ÷ 8.
4. £1,057 0s. 7½d. ÷ 16.
5. 390,024 7s. 8¼d. ÷ 638.
6. Bring £6 19s. 4¼d. to farthings.
7. How many £ s. d. are there in 10,932 farthings?
8. Reduce 6 qrs. 3 pks. 1 gall. 1 qt. to pints.
9. Bring 10,001 pints to quarters, etc.
10. Reduce 1 year 11 mths. 3 wks. 15 hrs. to minutes.
11. Bring 8,060,004 minutes to years (months, etc.).
12. Reduce 12 tons 5 cwt. 3 qrs. 16 lbs. to ozs.
13. Bring 1,214,503 drams to tons.
14. Reduce 7 fur. 13 poles 3 inches to inches.
15. Bring 314,156 inches to miles.
16. Reduce 1 ac. 2 roods 11 poles 3 yds. to sq. feet.
17. How many acres are there in 316,098 sq. yards?

Card 17.

1. Multiply £69 7s. 5¾d. by 50.
2. £927 4s. 8½d. × 176.
3. £6 9s. 7d. ÷ 10.
4. £4,766 13s. 0¼d. ÷ 17.
5. £210,981 17s. 0¼d. ÷ 101.
6. Bring £8 1s. 8¼d. to farthings.
7. How many £ s. d. are there in 4,264 farthings?
8. Reduce 7 qrs. 6 bus. 1 pk. 1 gall. 1 qt. to pints.
9. Bring 3,014 pints to quarters, etc.
10. Reduce 1 yr. 2 mths. 1 wk. 21 hrs. to minutes.
11. Bring 7,136,049 minutes to years (months, etc.).
12. Reduce 1 ton 8 cwt. 1 qr. 12 lbs. to ozs.
13. Bring 913,041 drams to tons.
14. Reduce 4 miles to inches.
15. Bring 1,716,143 inches to miles.
16. Reduce 5 ac. 2 roods 11 poles to square feet.
17. How many square poles are there in 9,061,415 sq. inches?

EXAMINATION TESTS—*cont.*

Card 15.

Boys.

1. How many square miles are there in nine million two hundred and ninety-two thousand eight hundred square yards?
2. What money should I have left out of £3,000 after paying 56 men each £45 1s. 11¼d.?
3. Divide £11,265 2s. 0¾d. by 27.
4. How many dollars of 4s. 1½d. each ought to be given in exchange for £76 10s. 4½d.?

Girls.

1. What is the amount of 64 times £34 15s. 4½d.?
2. How many years of 365 days each are there in one and a-half million minutes?
3. I have 17s. 6d.; how many oranges, at 3 for 2½d., could I purchase?
4. £316,009 0s. 0¼d. ÷ 19.

Card 16.

Boys.

1. I bought 2 cwt. of strawberries at 7s. a stone and sold them at 7½d. a lb.; what did I gain?
2. Divide £3,685 4s. 9½d. by 678.
3. Multiply £81 13s. 9d. by 76.
4. How many ounce-packets could be made out of 616 stones of tea?

Girls.

1. What change should I have out of £500 after paying 27 men £16 11s. 5d. each?
2. £30,164 ÷ 341.
3. How many miles, etc., are there in one hundred thousand and fifty inches?
4. How many half-crowns are there in the sum of 31 guineas; £18; 11 half-sovereigns and 90 pennies and 96 half-pennies?

Card 17.

Boys.

1. How many times can £2 14s. 1d. be subtracted from £35 3s. 1d.?
2. Multiply £25 6s. 0¾d. by 3,006.
3. How many allotments, each equal to 1 rood 17 poles, can be formed out of 44 ac. 28 poles?
4. How many square inches are there in 13 poles 15 yds. 7 feet?

Girls.

1. A chest of tea weighing 2 cwt. 3 qrs. 2 lbs. cost £43 18s. 4d., what is the cost of 1 lb.?
2. What sum of money multiplied by 89 will produce £1,756 7s. 2¼d.?
3. How many chains are there in 18 miles?
4. £73 18s. 10d. × 57.

TEST CARDS—*cont.*

Card 18.

1. Multiply £36 14s. 3½d. by 44.
2. £710 7s. 9¼d. × 513.
3. £7 14s. 3d. ÷ 11.
4. £3,805 5s. 3¼d. ÷ 28.
5. £156,317 11s. 1½d. ÷ 252.
6. Bring £20 2s. 5¼d. to farthings.
7. How many £ s. d. are there in 14,485 farthings?
8. Reduce 13 qrs. 7 bus. 3 pks. 1 gall. to pints.
9. Bring 5,010 pints to quarters, etc.
10. Reduce 2 yrs. 2 mths. 2 wks. 51 mins. to minutes.
11. Bring 5,370,816 minutes to years (months, etc.).
12. Reduce 5 tons 7 cwt. 13 lbs. to ozs.
13. Bring 913,061 drams to tons.
14. Reduce 3 miles 9 poles 2 yds. to inches.
15. Bring 141,081 feet to miles.
16. Reduce 9 sq. miles to sq. yards.
17. How many sq. poles are there in 316,998 sq. inches?

Card 19.

1. Multiply £78 2s. 4½d. by 55.
2. £317 19s. 1¼d. × 102.
3. £8 8s. 4d. ÷ 12.
4. £6,973 1s. 6d. ÷ 23.
5. £218,736 5s. 0¼d. ÷ 161.
6. Bring £1 4s. 7½d. to farthings.
7. How many £ s. d. are there in 2,986 farthings?
8. Reduce 14 qrs. 6 bus. 2 pks. 1 gall. 1 qt. to pints.
9. Bring 3,004 pints to quarters, etc.
10. Reduce 2 yrs. 7 mths. 3 wks. 1 day to minutes.
11. Bring 1,364,052 minutes to years (months, etc.).
12. Reduce 8 tons 6 cwt. 15 lbs. to ozs.
13. Bring 2,146,080 drams to tons.
14. Reduce 7 fur. 13 poles 3 yds. to inches.
15. Bring 9,106,341 inches to miles.
16. Reduce 7 miles 2 ac. 1 rood to sq. poles.
17. How many sq. poles are there in 906,001 sq. inches?

Card 20.

1. Multiply £44 13s. 6¼d. by 66.
2. £419 17s. 2¼d. × 913.
3. £9 15s. 6d. ÷ 5.
4. £5,087 12s. 9½d. ÷ 31.
5. £306,513 1s. 2½d. ÷ 243.
6. Bring £3 6s. 6½d. to farthings.
7. How many £ s. d. are there in 1,213 farthings?
8. Reduce 27 qrs. 7 bus. 3 pks. 1 gall. 1 qt. to pints.
9. Bring 2,060 pints to quarters, etc.
10. Reduce 6 yrs. 1 mth. 2 wks. 17 hrs. to minutes.
11. Bring 2,150,604 minutes to years (months, etc.).
12. Reduce 9 tons 6 cwt. 1 qr. 19 lbs. to lbs.
13. Bring 906,123 drams to tons.
14. Reduce 2 miles 3 fur. 11 poles 2 yds. to yards.
15. Bring 119,061 feet to miles.
16. Reduce 3 ac. 2 roods 19 poles to sq. feet.
17. How many sq. yds. are there in 917,164 sq. inches?

EXAMINATION TESTS—*cont.*

Card 18.

Boys.

1. I have £20: how much more money should I require to enable me to pay 15 men 19s. 10½d. each, 18 women 12s. 6d. each, and 10 boys 5s. 6d. each?
2. £4214 13s. 6d. ÷ 57.
3. Bring 5 sq. miles to sq. feet.
4. Multiply 18 guineas and 6½ by 1129.

Girls.

1. How many times is 3s. 4½d. contained in £23 2s. 4½d.?
2. Bring 28,224 three-halfpennies to guineas.
3. How many quarters are there in one million seven hundred and one quarts?
4. What is the 55th part of £3,592 10s. 7½d.?

Card 19.

Boys.

1. After paying for 2 gross of books at 4¼d. each, I had £1 17s. 6d. left; what had I at first?
2. £36 1s. 4¼d. × 2094.
3. How many quarter-pounds are there in one and a quarter ton?
4. Divide ten thousand and ten pounds and three halfpence by seventeen.

Girls.

1. What distance should I walk in 7 hours, supposing I take 20 steps a minute, and each step measures 1½ feet?
2. $\frac{1}{11}$th of £314 5s. 8½d.
3. Multiply £13 17s. 4¾d. by 1111.
4. Reduce 3½ acres to square yards.

Card 20.

Boys.

1. A farmer bought 13 cows for £375 8s. 0¼d., and sold them for £389 4s. 6¾d; what did he gain on each cow?
2. Divide one hundred thousand and sixty pounds by one hundred and ninety-eight.
3. Find the difference in chains between 3 miles 7 fur. and three hundred and sixteen thousand eight hundred inches.
4. Multiply £17 19s. 4½d. by 361.

Girls.

1. What is 37 times £39 17s. 4¼d.?
2. If a yard of telegraph wire weigh 4½ ounces, what would half-a-mile weigh?
3. £1,061 17s. 4¼d. ÷ 19.
4. How many crowns are there in sixty-five guineas?

TEST CARDS—*cont.*

Card 21.

1. Multiply £87 15s. 8¼d. by 33.
2. £586 14s. 2½d. × 224.
3. £10 7s. 5d. ÷ 8.
4. £4107 4s. 2½d. ÷ 32.
5. £460,315 2s. 1¼d. ÷ 302.
6. Bring £5 8s. 6½d. to farthings.
7. How many £ s. d. are there in 6,882 farthings?
8. Reduce 6 qrs. 1 bus. 3 pk. 1 gall. 1 qt. to pints.
9. Bring 4,015 pints to quarters, etc.
10. Reduce 5 yrs. 1 mth. 2 wks. 17 min. to mins.
11. Bring 5,081,071 minutes to years (months, etc.).
12. Reduce 3 tons 15 cwt. 5 ozs. to ozs.
13. Bring 115,006 ozs. to tons.
14. Reduce 5 fur. 17 poles 2 ft. to inches.
15. Bring 411,906 yds. to miles.
16. Reduce 5 sq. miles 3 acres 11 poles to poles.
17. How many acres are there in 3,160,417 square feet?

Card 22.

1. Multiply £55 17s. 9¼d. by 88.
2. £717 13s. 1¼d. × 835.
3. £13 16s. 5d. ÷ 11.
4. £3206 0s. 6½d. ÷ 43.
5. £571,214 9s. 2¾d. ÷ 970.
6. Bring £7 11s. 5¼d. to farthings.
7. How many £ s. d. are there in 7,893 farthings?
8. Reduce 7 qrs. 4 bus. 2 pks. 1 pint to pints.
9. Bring 2,016 pints to quarters, etc.
10. Reduce 2 years 7 mths. 1 wk. to minutes.
11. Bring 3,604,217 minutes to years (months).
12. Reduce 15 cwt. 3 qr. 1 st. 7 lbs. to ounces.
13. Bring 3,161,408 drams to tons.
14. Reduce 2 miles 1 fur. 15 pls. 3 yds. to feet.
15. Bring 3,160,914 inches to miles.
16. Reduce 3 roods 15 pls. 7 ft. 18 inches to inches.
17. How many miles are there in 316,149 square poles?

Card 23.

1. Multiply £93 1s. 10¼d. by 99.
2. £641 12s. 3¾d. × 346.
3. £15 6s. 6d. ÷ 12.
4. £2,395 2s. 9d. ÷ 54.
5. £641,217 2s. 9¼d. ÷ 381.
6. Bring £9 13s. 7¼d. to farthings.
7. How many £ s. d. are there in 2,714 farthings?
8. Reduce 9 qrs. 6 bush. 1 pk. 1 qt. to pints.
9. Bring 1,210 pints to quarters, etc.
10. Reduce 3 yrs. 1 month 2 wks. 1 day to mins.
11. Bring 1,714,098 minutes to years (months).
12. Reduce 18 cwt. 1 st. 13 lb. to ozs.
13. Bring 306,009 ozs. to tons.
14. Reduce 3 miles 7 fur. 15 poles 2¼ yds. to feet.
15. Bring 516,009 yds. to miles.
16. Reduce 3 ac. 2 rds. 11 poles 19¼ yds. to square yards.
17. How many square miles are there in 131,640 poles?

EXAMINATION TESTS—*cont.*

Card 21.

Boys.

1. A man earns 5s. 4½d. a day; what is that a year?
2. How many chains, etc. are there in one hundred and fifty thousand inches?
3. Tobacco is worth 4d. per oz.; what is the value of 2 stones?
4. £69 17s. 4½d. × 306.

Girls.

1. How many seconds were there in the year 1892?
2. Reduce 2 acs. 1 rd. 19 ins. to inches.
3. Divide £3,064 19s. 1¼d. by 36.
4. Reduce 3,164 half-guineas to farthings.

Card 22.

Boys.

1. How many half-crowns are there in 60,840 farthings?
2. How many 2-oz. packets could be made out of £9 16s. 0d. worth of sweets at £1 8s. 0d. per cwt.?
3. £1,161 15s. 2½d. ÷ 19.
4. Reduce 3 square miles to square yards.

Girls.

1. What is the weight of 17 loads of coal if one load weigh 1 ton 3 cwts. 2 qrs.?
2. £53 15s. 2¼d. × 74.
3. Find the difference between ten thousand three-halfpennies and 18 guineas?
4. What is the ninth part of £29 9s. 8¼d.?

Card 23.

Boys.

1. How many ounces must be added to 1,760 lbs. to make one ton?
2. At a concert 80 pay half-a-crown each, 50 pay a florin each, 100 pay 1s., and the remainder 6d. If £25 were taken altogether, how many paid 6d.?
3. Divide £15,161 15s. 2½d. by 417.
4. Multiply £169 10s. 1¼d. by 89.

Girls.

1. Multiply £131 13s. 2½d. by 106.
2. Eggs are 16 for 1s.; how many could I buy with £1 4s. 3d.?
3. Reduce 18 bushels to half-pints.
4. What sum of money multiplied by 89 will produce £166 6s. 4½d.?

TEST CARDS—*cont.*

Card 24.

1. Multiply £68 4s. 8¼d. by 27.
2. £583 10s. 0¾d. × 757.
3. £17 15s. 4d. ÷ 9.
4. £1,064 11s. 3¾d. ÷ 65.
5. £706,070 7s. 2½d. ÷ 434.
6. Bring £10 14s. 4¼d. to farthings.
7. How many £ s. d. are there in 5,071 farthings?
8. Reduce 15 qrs. 2 bus. 1 gall. to pints.
9. Bring 3,016 pints to quarters, etc.
10. Reduce 2 yrs. 7 mths. 1 wk. 13 hours to mins.
11. Bring 560,601 minutes to years (months, etc.).
12. Reduce 14 tons 3 cwt. 2 qrs. 1 st. to lbs.
13. Bring 416,001 ozs. to tons.
14. Reduce 5 fur. 13 poles 3 yds. to inches.
15. Bring 1,117,006 inches to miles.
16. Reduce 3 roods 14 poles 2 yds. 3 feet to sq. inches.
17. How many acres are there in 900,612 sq. feet?

Card 25.

1. Multiply £76 3s. 7¼d. by 45.
2. £710 11s. 4d. × 468.
3. £11 5s. 3d. ÷ 12.
4. £8,403 3s. 7¾d. ÷ 26.
5. £870,600 2s. 7¼d. ÷ 801.
6. Bring £12 0s. 8½d. to farthings.
7. How many £ s. d. are there in 10,610 farthings?
8. Reduce 13 qrs 5 bus. 1 gall. 1 qt. to pints.
9. Bring 9,045 pints to quarters, etc.
10. Reduce 3 yrs. 1 mth. 2 wks. to minutes.
11. Bring 876,432 minutes to years (months, etc.).
12. Reduce 3 tons 15 cwt. 2 qrs. 11 lbs. to lbs.
13. Bring 115,040 ounces to tons.
14. Reduce 2 miles 1 fur. 2 ft. 10 ins. to inches.
15. Bring 117,164 inches to poles.
16. Reduce 2 acs. 1 rd. 20 pls. 2½ yds. 1 ft. to feet.
17. How many acres are there in 1,816,040 square yards?

Card 26.

1. Multiply £72 12s. 6½d. by 48.
2. £401 9s. 9¾d. × 679.
3. £12 14s. 7d. ÷ 4.
4. £7,548 1s. 0d. ÷ 33.
5. £900,000 0s. 1d. ÷ 490.
6. Bring £15 1s. 3½d. to farthings.
7. How many £ s. d. are there in 9,019 farthings?
8. Reduce 4 qrs. 7 bus. 2 pks. 1 gall. to pints.
9. Bring 13,007 pints to quarters, etc.
10. Reduce 4 yrs. 5 mths. 3 wks. to minutes.
11. Bring 213,562 minutes to years (months, etc.).
12. Reduce 5 tons 2 cwts. 1 qr. 1 st. 11 lbs. 15 ozs. to ounces.
13. Bring 1,141,600 drams to tons.
14. Reduce 6 fur. 4 pls. 3 yds. 1 ft. to inches.
15. Bring 114,161 yards to miles.
16. Reduce 5 sq. miles 310 acs. to poles.
17. How many square poles are there in 4,141,609 square inches?

EXAMINATION TESTS—*cont.*

Card 24.

Boys.

1. Divide twenty thousand and six pounds eleven shillings and fourpence farthing by three hundred and six.
2. How many more seconds were there in February 1892 than February 1893?
3. A man earns £250 a year; he spends £3 15s. 6d. a week. What does he save in a year?
4. Multiply £37 3s. 6¼d. by 1,014.

Girls.

1. How many times will the wheel of a bicycle which is 3 ft. 8 ins. in circumference turn round in travelling a mile?
2. Multiply £431 15s. 0½d. by 190.
3. How many guineas are there in nineteen thousand one hundred and fifty-two farthings?
4. What is the sixty-third part of £117 14s. 7½d.?

Card 25.

Boys.

1. Find the cost of an acre of land at half-a-crown per square foot.
2. Multiply £11 3s. 6½d. by 3,001.
3. A man brought a gross of articles at 8s. a dozen and sold them at the rate of 3 for half-a-crown; what did he gain?
4. I gave £11 13s. 3½d. to be distributed among 11 poor men; what did each get?

Girls.

1. Divide 1,464 7s. 1d. by 37.
2. How much money can a man earn in a year of 365 days if he earns at the rate of 5s. 6d. per day?
3. Reduce three million fourteen thousand and eight half-pints to quarters.
4. Multiply £30 19s. 11¼d. by 54.

Card 26.

Boys.

1. What would £15 17s. 4½d. amount to if added to itself 37 times?
2. Which is the greater, and by how much: 22 miles 3 fur. 2 poles, or 1,860 chains?
3. Divide £1,604 17s. 1½d. by 185.
4. A barrel of sugar weighed 4 cwts.; the barrel weighed 4 stones. How many ounces of sugar were there?

Girls.

1. What is the value of 36 sheep at £3 11s. 4½d. each?
2. Bring two million square inches to roods, etc.
3. £26,655 5s. 1½d. ÷ 17.
4. What change should I have out of £100 after paying 32 men £1 17s. 6½d. each?

TEST CARDS—*cont.*

Card 27.

1. Multiply £69 11s. 1½d. by 21.
2. £900 7s. 8½d. × 580.
3. £16 3s. 8d. ÷ 7.
4. £3,601 3s. 4½d. ÷ 81.
5. £150,604 0s. 9¼d. ÷ 515.
6. Bring £16 2s. 9½d. to farthings.
7. How many £ s. d. are there in 3,701 farthings?
8. Reduce 5 qrs. 4 bus. 3 pks. 1 gall. 1 qt. to pints.
9. Bring 1204 pints to quarters, etc.
10. Reduce 1 year 1 mth. 3 wks. 17 hrs. to minutes.
11. Bring 364,089 minutes to years (months, etc.).
12. Reduce 15 cwts. 2 qrs. to lbs.
13. Bring 115,160 drams to stones.
14. Reduce 3 miles 6 furs. 18 pls. 2 yds. 3 ins. to inches.
15. Bring 117,164 inches to poles.
16. Reduce 13 sq. pls. 9¼ yds. 7 ft. 120 ins. to sq. inches.
17. How many acres are there in 176,812 sq. yards?

Card 28.

1. Multiply £80 1s. 11½d. by 28.
2. £121 1s. 5¼d. × 591.
3. £17 13s. 2d. ÷ 9.
4. £5,737 10s. 7¼d. ÷ 90.
5. £206,305 2s. 3¼d. ÷ 720.
6. Bring £17 3s. 2¼d. to farthings.
7. How many £ s. d. are there in 13,928 farthings?
8. Reduce 8 qrs. 3 bus. 1 qt. to pints.
9. Bring 3,017 pints to quarters, etc.
10. Reduce 10 yrs. 11 mths. 1 wk. 16 mins. to minutes.
11. Bring 517,081 minutes to years (months, etc.).
12. Reduce 3 tons 18 cwts. 57 lbs. to lbs.
13. Bring 1,141,967 drams to cwts.
14. Reduce 7 furs. 27 pls. 2 yds. to inches.
15. Bring 3,141,600 inches to miles.
16. Reduce 29½ yds. 3 sq. ft. 137 inches to sq. inches.
17. How many square miles in 360,040 poles?

Card 29.

1. Multiply £51 9s. 10½d. by 35.
2. £632 2s. 7½d. × 102.
3. £21 2s. 1d. ÷ 11.
4. £6,006 2s. 0d. ÷ 18.
5. £608,090 7s. 1¾d. ÷ 506.
6. Bring £18 4s. 1¼d. to farthings.
7. How many £ s. d. are there in 19,600 farthings?
8. Reduce 3 qrs. 2 bus. 3 pks. 1 gall. 1 qt. to pints.
9. Bring 13,017 pints to quarters, etc.
10. Reduce 2 years 7 months 3 weeks 1 day to minutes.
11. Bring 604,321 minutes to years (months).
12. Reduce 10 cwt. 13 oz. 12 drams to drams.
13. Bring 176,234 lbs. to tons.
14. Reduce 37 miles 2 ft. 10 inches to inches.
15. Bring 316,041 inches to chains.
16. Reduce 3 ac. 1 rd. 39 poles to sq. yds.
17. How many acres are there in 639,214 sq. yards?

EXAMINATION TESTS—*cont.*

Card 27.

Boys.

1. A man agreed to pay off his debt of £63 8s. 3d. at the rate of £1 2s. 3d. per week. How many weeks would it take him to pay it?
2. How many seconds are there in the last three months of the year?
3. Multiply nine hundred and seven pounds sixteen shillings and fourpence half-penny by twenty-six.
4. How many guineas etc. are there in half-a-million half-pennies?

Girls.

1. Divide thirty-four thousand seven hundred and thirty pounds sixteen shillings and seven pence half-penny by eighty-six.
2. What amount divided by eighteen will give forty-two pounds five shillings and a farthing?
3. How many bushels are there in three hundred thousand three hundred quarts?
4. A man smokes half-an-ounce of tobacco per day; how much is that in a year of 365 days?

Card 28.

Boys.

1. Multiply £595 9s. 5½d. by 56.
2. What sum of money multiplied by 47 will amount to forty-two pounds five shillings and a farthing?
3. Bring 3 qrs. 5 bus. 2 pks. 1 gall. to half-pints.
4. If a man drinks 3 glasses of beer a day at 1½d. a glass, how much does he spend in a year of 365 days?

Girls.

1. What would 36 sheep cost, if one cost £3 17s. 4½d.?
2. Divide forty thousand eight hundred and nineteen pounds thirteen shillings and sixpence by twenty-six.
3. How many score of rabbits could I buy with £4 2s. 6d. at 1s. 4½d. each?
4. How many chains are there in 140 miles?

Card 29.

Boys.

1. How many times will a clock tick in a fortnight, if it ticks once every second?
2. £31,460 0s. 4½d. ÷ 399.
3. What would be the cost of 310 slates at 2d. each and 150 exercise books at 4d. each?
4. Find the cost of 14 tons 3 qrs. of sugar at 1s. 10¼d. per stone.

Girls.

1. How many lbs. of tea at 1s. 8d. per lb. must I give in exchange for 2½ cwts. of sugar at 1s. 9d. per stone?
2. Multiply seventeen pounds eleven shillings and three-half-pence by five thousand and nineteen.
3. Find the value of a field measuring 2 roods, 15 poles, 2¼ yds. at 2s. 6d. per square yard.
4. Divide three thousand and fourteen pounds sixteen shillings and a half-penny by thirteen.

TEST CARDS—*cont.*

Card 30.

1. Multiply £93 15s. 8¼d. by 42.
2. £541 3s. 6¼d. × 203.
3. £14 12s. 0d. ÷ 12.
4. £1,829 4s. 4¼d. ÷ 29.
5. £471,361 4s. 1½d. ÷ 617.
6. Bring £19 5s. 0¼d. to farthings.
7. How many £ s. d. are there in 5,686 farthings?
8. Reduce 12 qrs. 1 bus. 2 pks. 1 qt. to pints.
9. Bring 1,214 pints to quarters, etc.
10. Reduce 6 years 4 months 1 week 17 hours to minutes.
11. Bring 710,081 minutes to years (months, etc).
12. Reduce 3 qrs. 1 stone 11 lbs. to ounces.
13. Bring 114,235 drams to stones.
14. Reduce 3 fur. 20 poles 2 yds. 1 ft. to inches.
15. Bring 765,432 chains to miles.
16. Reduce 1 mile 300 ac. 3 rds. 19 pls. to poles.
17. How many acres are there in 3,145,216 sq. feet?

Card 31.

1. Multiply £17 14s. 2½d. by 20.
2. £302 3s. 4½d. × 401.
3. £17 3s. 0¼d. ÷ 9.
4. £1,988 1s. 4d. ÷ 64.
5. £116,871 6s. 2½d. ÷ 739.
6. Bring £13 2s. 4½d. to farthings.
7. How many £ s. d. are there in 2,845 farthings?
8. Reduce 11 qrs. 4 bus. 1 pk. 1 qt. to pints.
9. Bring 3,776 pints to quarters, etc.
10. Reduce 3 years 3 months 1 week 6 hours to minutes.
11. Bring 817,364 minutes to years (months, etc).
12. Reduce 1 ton 15 cwt. 3 qrs. to ounces.
13. Bring 119,314 lbs. to tons.
14. Reduce 3 miles 6 fur. 15 pls. 2½ yds. to feet.
15. Bring 7,196,143 inches to miles.
16. Reduce 3 ac. 2 rds. 15 pls. 14¼ yds. to sq. yds.
17. How many sq. poles are there in 713,415 square inches?

Card 32.

1. Multiply £63 9s. 1¼d. by 18.
2. £561 17s. 9¾d. × 580.
3. £13 12s. 2½d. ÷ 11.
4. £3,462 15s. 9d. ÷ 36.
5. £170,767 10s. 10¾d. ÷ 971.
6. Bring £4 1s. 6¼d. to farthings.
7. How many £ s. d. are there in 3,554 farthings?
8. Reduce 7 qrs. 1 gall. to pints.
9. Bring 10,011 pints to quarters, etc.
10. Reduce 2 years 11 months 1 week to minutes.
11. Bring 551,426 minutes to years (months, etc.)
12. Reduce 17 cwt. 2 qrs. 1 lb. 13 ozs. to ounces.
13. Bring 164,139 drams to stones.
14. Reduce 3 miles 7 fur. 15 poles to yards.
15. Bring 319,164 inches to chains.
16. Reduce 2 roods, 13 poles, 29½ yds. 3 ft. to square feet.
17. How many sq. poles in 4,391,641 square inches?

EXAMINATION TESTS—*cont.*

Card 30.

Boys.

1. Divide four thousand four hundred and thirty-six pounds thirteen shillings and fourpence by 26.
2. How many farthings are there in 131 guineas?
3. How many times can £3 1s. 4½d. be subtracted from £187 3s. 10½d.?
4. Reduce 15 miles 3 fur. 6 chains 3 poles to feet.

Girls.

1. Multiply £11 17s. 4¼d. by 4,019.
2. How many lemons at 1½d. each could I purchase with £18 6s. 4½d.?
3. Find the thirty-ninth part of six thousand three hundred and fifty pounds eleven shillings and three-pence farthing.
4. How many tons, etc., are there in three million thirteen thousand drams?

Card 31.

Boys.

1. How many guineas are there in three thousand three hundred and sixty three-pences?
2. Divide eight thousand four hundred and eighty-one pounds eleven shillings and sixpence half-penny by one hundred and seventeen.
3. How many acres are there in one million square feet?
4. A man bought 16 chairs and 13 tables for £26 10s. 9½d. Each chair cost 17s. 6d. What was the cost of each table?

Girls.

1. Divide thirty thousand six hundred and one pounds by seventeen.
2. How many years of 365 days are there in two hundred and thirteen million and eighty-four thousand seconds?
3. Multiply £74 2s. 9¼d. by 561.
4. A field contains 1½ acres. How many square feet will remain after taking away 2 poles 15½ sq. yds?

Card 32.

Boys.

1. Divide nine thousand four hundred and seventy-eight pounds and two pence by fifty-two.
2. How many people went to an entertainment where the price for admission was 2d., thirty-five guineas being taken in all?
3. Eight nails weigh a pound; what weight of iron is there in a quarter of a million such nails?
4. Multiply £7 14s. 8¼d. by 10,016.

Girls.

1. Multiply fifteen pounds nine shillings and seven pence farthing by three hundred and eleven.
2. How many farthings are there in £27 13s. 2¾d.?
3. How many quarters are there in three hundred thousand and sixty half-pints?
4. What sum of money multiplied by 2,016 will produce £4,815 6s.?

TEST CARDS—*cont.*

Card 33.

1. Multiply £14 2s. 4¼d. by 49.
2. £179 0s. 5¼d. × 716.
3. £15 0s. 10¾d. ÷ 7.
4. £7,028 10s. 0d. ÷ 96.
5. £385,861 8s. 8d. ÷ 563.
6. Bring £15 3s. 9¼d. to farthings.
7. How many £ s. d. are there in 4,668 farthings?
8. Reduce 14 qrs. 7 bus. 2 pks. 1 gall. to pints.
9. Bring 5,761 pints to quarters, etc.
10. Reduce 1 yr. 3 mths. 2 wks. 6 days to minutes.
11. Bring 637,123 minutes to years (months, etc.).
12. Reduce 1 ton 10 cwt. 2 qrs. 1 st. to pounds.
13. Bring 306,114 ozs. to tons.
14. Reduce 5 miles 3 fur. 30 poles 3 yds. to feet.
15. Bring 246,890 inches to miles.
16. Reduce 3 ac. 2 roods 14 poles 19 yds. to feet.
17. How many miles are there in 13,978,164 sq. poles?

Card 34.

1. Multiply £5 0s. 8¼d. by 70.
2. £231 11s. 2½d. × 420.
3. £1 17s. 9¾d. ÷ 12.
4. £4,296 10s. 7½d. ÷ 55.
5. £164,246 1s. 6d. ÷ 568.
6. Bring £5 3s. 6¼d. to farthings.
7. How many £ s. d. are there in 5,388 farthings?
8. Reduce 14 qrs. 7 bus. 2 pks. 1 gall. to pints.
9. Bring 1,700 pints to quarters.
10. Reduce 3 yrs. 2 mths. 1 wk. 23 hrs. to minutes.
11. Bring 796,378 minutes to years (months, etc.).
12. Reduce 18 cwt. 2 qrs. 13 lbs. 11 ozs. to ounces.
13. Bring 2,164,178 drams to tons.
14. Reduce 7 fur. 15 poles 2¼ yds. 11 ins. to inches.
15. Bring 716,419 inches to miles.
16. Reduce 15 sq. poles 29¼ yds. 3 ft. 76 ins. to square inches.
17. How many acres are there in 314,169 sq. yds.?

Card 35.

1. Multiply £16 16s. 6¼d. by 32.
2. £617 2s. 6¼d. × 234.
3. £2 3s. 2¾d. ÷ 6.
4. £3,486 2s. 0d. ÷ 48.
5. £54,592 13s. 7¾d. ÷ 617.
6. Bring £18 7s. 9¼d. to farthings.
7. How many £ s. d. are there in 2,464 farthings?
8. Reduce 15 qrs. 6 bus. 3 pks. 1 gall. 1 qt. to pints.
9. Bring 8,974 pints to quarters.
10. Reduce 1 yr. 2 mths. 1 wk. to minutes.
11. Bring 897,101 minutes to years (months, etc.).
12. Reduce 117 st. 13 lbs. 7 ozs. 8 drs. to drams.
13. Bring 9,114,316 drams to tons.
14. Reduce 5 miles 3 fur. 7 poles 2 ft. 9 ins. to inches.
15. Bring 31,691 yards to miles.
16. Reduce 4 sq. miles 43 ac. 2 roods 7 poles to poles.
17. How many square poles are there in 1,369,000 sq. inches?

EXAMINATION TESTS—*cont.*

Card 33.

Boys.

1. How many feet will a train which travels at the rate of 45 miles an hour travel in 5 hours?
2. Divide seven thousand eight hundred and ninety-four pounds four shillings and a penny farthing by one hundred and thirty.
3. What would four thousand four hundred and ninety-five three-penny books cost?
4. £21 11s. 10¾d. × 340.

Girls.

1. If my step measures 14 inches, how many steps would I take in walking 2 miles 20 pls. 4 yds. 1 ft. 8 ins.?
2. How much money should I require to give 97 men each £18 13s. 4¼d.?
3. Divide ten thousand six hundred and four pounds by thirty-one.
4. How many £ s. are there in 7,520 half-pennies?

Card 34.

Boys.

1. To how many people could I give 1 pk. 2 qts. out of a cask containing 11 qrs. 5 bus. 3 pks.
2. How much short of £20 are eighteen thousand one hundred and seventy-seven farthings?
3. £12 18s. 6¼d. × 3,016.
4. Divide three thousand six hundred and ninety-one pounds one shilling and fourpence by fifty-eight.

Girls.

1. How many square inches are there in 36¼ sq. yds. 7 ft. 36 ins.?
2. Divide six thousand and four pounds two shillings and ninepence by sixty-four.
3. Divide £1 6s. 0s. into heaps, each containing a half-crown, shilling, sixpence, three-penny piece, and a penny; how many heaps could you get?
4. Multiply £86 11s. 11¾d. by 51.

Card 35.

Boys.

1. A boy puts 3d. a week in the bank. How much money will he have when he reaches his 21st birthday?
2. Find seventeen times six hundred and ten pounds seventeen shillings and threepence halfpenny.
3. Divide nineteen thousand eight hundred and eighty-five pounds four shillings and five pence farthing by nineteen.
4. Bring 114,936 feet to miles, etc.

Girls.

1. How many more farthings are there in £20 than in 18 guineas?
2. £312 17s. 9½d. × 36.
3. Divide one thousand nine hundred and one pound ten shillings and four pence halfpenny by 65.
4. How many chains are there in thirty thousand inches?

ANSWERS.

TEST CARDS.

Card 1.

1. £978 5s. 0d.
2. £98,159 12s. 10½d.
3. £1 7s. 0d. + 1.
4. £74 11s. 5½d. + 3.
5. £450 3s. 8¾d. + 112.
6. 3,098.
7. £3 6s. 7½d.
8. 1,530 pts.
9. 8 qrs. 6 bus. 3 pks. 1 gal. 2 qts.
10. 1,681,920 min.
11. 2 yrs. 4 mths. 5 days.
12. 117,584 oz.
13. 5 tons 8 cwt. 3 qrs. 1 st. 5 lbs. 6 ozs. 1 dr.
14. 7,602 ft.
15. 2 mls. 1 fur. 32 pls. 2 ft.
16. 5,302,908 sq. in.
17. 27 pls. 2¼ yds. 7 in.

Card 2.

1. £1,988 1s. 4d.
2. £293,469 1s. 9d.
3. £0 4s. 1½d. + 8.
4. £176 9s. 5½d. + 2.
5. £2,550 18s. 5½d. + 218.
6. 4,121.
7. £4 5s. 9d.
8. 936 pts.
9. 13 qrs. 6 bus. 1 pt.
10. 625,560.
11. 4 yrs. 4 mths. 5 dys. 8 hrs. 36 min.
12. 561,344 oz.
13. 2 tons 3 cwt 4 lbs. 14 ozs. 12 drs.
14. 23,349½ ft.
15. 2 mls. 21 pls. 3½ yds. 2 in.
16. 558,234 sq. in.
17. 1 rd. 38 pls. 13½ yds. 4 ft. 77 in.

Card 3.

1. £3,935 1s. 7½d.
2. £154,667 4s. 0½d.
3. £0 8s. 7d. + 5.
4. £99 11s. 9½d. + 9.
5. £289 11s. 9d. + 222.
6. 5,403.
7. £4 17s. 2¼d.
8. 2,686 pts.
9. 19 qrs. 5 bus. 1 gall. 2 qts.
10. 1,176,495.
11. 7 yrs. 10 mths. 1 wk. 7 hrs. 24 min.
12. 253,584 ozs.
13. 3 tons 7 cwt. 2 qrs. 2 lbs. 8 oz. 14 drs.
14. 4,835⅛ ft.
15. 8 mls. 6 furs. 28 pls. 5½ yds. 1 ft. 6 in.
16. 1,575,079 sq. in.
17. 1 ac. 3 rd. 29 pl. 23¾ yds. 8 ft. 40 in.

Card 4.

1. £3,881 2s. 6¾d.
2. £27,026 9s.
3. £0 18s. 2¼d. + 4.
4. £139 16s. 5½d. + 22.
5. £1,339 14s. 4¾d. + 173.
6. 8,154.
7. £5 11s. 1¾d.
8. 3,494 pts.
9. 14 qrs. 2 bus. 3 pks. 2 qts. 1 pt.
10. 675,370.
11. 10 yrs. 7 mths. 1 dy. 15 hrs. 26 min.
12. 352,176 ozs.
13. 4 tons 5 cwt. 1 qr. 1 st. 8 oz. 12 drs.
14. 5,780 ft.
15. 9 mls. 4 furs. 27 pls. 2½ yds. 1 ft.
16. 1,962,936.
17. 2 rds. 22 pls. ½ yd. 7 ft. 137 in.

Card 5.

1. £305 17s. 8½d.
2. £299,032 8s. 10½d.
3. £0 16s. 4d. + 1.
4. £589 1s. 7d. + 10.
5. £369 19s. 0¾d. + 265.
6. 3,053.
7. £17 0s. 6¼d.
8. 2,777 pts.
9. 13 qrs. 6 bus. 3 pks. 1 qt.
10. 1,101,600 min.
11. 3 yrs. 9 mths. 1 dy. 3 hrs. 10 min.
12. 421,600 ozs.
13. 3 tons 11 cwt. 3 qrs. 11 lbs. 6 ozs. 13 drs.
14. 4,874½ ft.
15. 5 mls. 5 yds. 5 in.
16. 153,830¼ sq. ft.
17. 2 rds. 0 pls. 4 yds. 1 ft. 60 in.

Card 6.

1. £3,462 15s. 9d.
2. £526,331 15s. 8½d.
3. £0 17s. 9d. + 2.
4. £259 11s. 6½d. + 22.
5. £1,242 11s. 6¾d. + 121.
6. 9,698.
7. £8 3s. 2½d.
8. 3,880 pts.
9. 5 qr. 7 bus. 3 pks. 2 qts. 1 pt.
10. 1,058,700 min.
11. 6 yrs. 4 mths. 2 wks. 3 dys. 22 hrs. 26 min.
12. 506,304 oz.
13. 1 ton 15 cwt. 1 st. 9 lbs. 7 drs.
14. 79,308 in.
15. 4 mls. 3 pls. ½ yd. 8 in.
16. 6,861,708 sq. in.
17. 1 ac. 1 rd. 29 pls. 21¾ yc's. 1 ft. 12 in.

Card 7.

1. £669 11s. 6d.
2. £116,870 10s. 9¾d.
3. £0 3s. 11¼d. + 2.
4. £420 10s. 1½d. + 1.
5. £7,711 0s. 10½d. + 23.
6. 6,103.
7. £9 11s. 11¾d.
8. 4,434 pts.
9. 13 qrs. 3 bus. 2 pk. 1 gall. 1 qt.
10. 578,880 min.

Card 7—*cont.*

11. 4 yrs. 1 mth. 2 wk. 3 dys. 14 hrs. 6 min.
12. 608,912 ozs.
13. 9 tons 5 cwt. 1 st. 8 lbs. 3 oz. 6 drs.
14. 132,768 in.
15. 4 mls. 7 furs. 36 pls. 1 ft. 1 in.
16. 24,258¼ sq. ft.
17. 19 acs. 3 rds. 4 pls. 4 ft.

Card 8.

1. £2,660 3s. 4d.
2. £215,665 1s. 6¾d.
3. £0 5s. 10½d. + 4.
4. £175 7s. 10¾d. + 26.
5. £297 8s. 9d. + 81.
6. 1,105.
7. £1 15s. 6½.
8. 5,032 pts.
9. 33 qrs. 1 bus. 2 pk. 1 gal. 3 qts.
10. 535,140 min.

Card 8—*cont.*

11. 11 yrs. 7 mth. 2 wks. 5 dys. 4 hrs. 24 min.
12. 742,448.
13. 7 tons 6 cwt. 2 qrs. 2 lbs. 3 oz. 2 drs.
14. 56,034.
15. 2 mls. 6 furs. 25 pls. 2½ yc's. 2 ft. 10 in.
16. 64,140¾ sq. ft.
17. 2 rds. 15 yds. 2 ft. 43 in.

Card 9.

1. £2,668 17s. 0½d.
2. £295,769 5s.
3. £2 2s. 0¼d. + 1.
4. £171 2s. 10½d. + 24.
5. £327 17s. 7d. + 542.
6. 2,121.
7. £3 2s. 4¼d.
8. 5,624 pts.
9. 29 qrs. 4 bus. 1 qt.
10. 2,348,655 min.
11. 14 yrs. 6 mths. 1 wk. 3 dys. 1 hr. 16 min.
12. 902,368 ozs.
13. 2 tons 15 cwt. 3 qrs. 8 lbs.
14. 47,715 in.
15. 1 ml. 7 furs. 23 pls. 2½ yds. 1 ft.
16. 3,174,048 sq. in.
17. 7 ac. 1 rd. 37 pls. 12¾ yds. 3 ft.

Card 10.

1. £7,028 10s.
2. £21,857 7s. 2¾d.
3. £0 14s. 11d.
4. £23 3s. 9½ + 32.
5. £5,249 7s. 5¾d. + 147.
6. 5,141.
7. £5 3s. 1½d.
8. 5,650 pts.
9. 9 qrs. 7 bus. 2 pks. 1 gall. 2 qts.
10. 1,072,560 min.
11. 16 yrs. 10 mths. 1 wk. 21 hrs. 24 min.
12. 705,728 ozs.
13. 8 tons 18 cwt. 2 lbs. 6 ozs. 7 drs.
14. 63,978 inches.
15. 5 mls. 1 pl. 1½ yds. 8 in.
16. 19,327,661 sq. in.
17. 1 ac. 22 pls. 25½ yds. 7 ft. 128 in.

Card 11.

1. £3,481 10s. 9d.
2. £154,899 9s. 5d.
3. £0 10s. 11½d.
4. £31 16s. 6½d. + 32.
5. £770 11s. 9½d. + 320.
6. 6,197.
7. £6 4s. 2½d.
8. 8,808 pts.
9. 5 qrs. 7 bus. 1 qt.
10. 574,595 min.
11. 2 yrs. 3 mths. 1 wk. 1 dy. 14 hrs. 6 min.
12. 667,184 ozs.
13. 2 tons 3 cwt. 4 lbs. 9 ozs. 3 drs.
14. 47,697 inches.
15. 6 ml. 4 furs. 25 pls. 2½ yds. 2 ft. 4 in.
16. 35,936¾ feet.
17. 1 rd. 15 pls. 9¼ yds. 6 ft. 75 in.

Card 12.

1. £3,774 13s. 6d.
2. £164,246 1s. 6d.
3. £1 13s. 4¾d. + 3.
4. £216 12s. 6½d. + 6.
5. £1,200 4s. 8¾d. + 258.
6. 7,738.
7. £7 5s. 3¾d.
8. 9,394 pts.
9. 5 qrs. 7 bus. 3 pks. 2 qts.
10. 503,220 min.
11. 6 yrs. 7 mths. 1 wk. 3 dys. 12 hrs. 56 min.
12. 258,640 ozs.
13. 2 tons, 16 cwt. 1 qr. 5 lbs. 9 ozs. 13 drs.
14. 5,777 feet.
15. 1 ml. 5 furs. 11 pls. 4½ yds. 1 ft. 2 in.
16. 44,448¾ sq. ft.
17. 8 acs. 1 rd. 21 pls. 6¾ yds. 1 sq. ft.

Card 13.

1. £3,392 2s. 3d.
2. £398,461 10s. 10½d.
3. £0 17s. 2¼d. + 1.
4. £103 14s. 4¾d. + 80.
5. £764 7s. 2¾d. + 88.
6. 10,226.
7. £8 6s. 5d.
8. 12,520 pts.
9. 26 qrs. 7 bus.
10. 855,419 min.
11. 14 yrs. 7 mths. 3 wks. 2 dys. 19 hrs. 57 min.
12. 522,528 ozs.
13. 1 ton 11 cwt. 3 qrs. 1 st. 8 ozs. 12 drs.
14. 7,065⅞ ft.
15. 3 mls. 3 furs. 10 pls. 5 yds. 1 in.
16. 21,031⅞ sq. yds.
17. 4 acs. 2 rds. 6 yds. 7 ft.

Card 14.

1. £980 1s. 3d.
2. £80,442 8s. 5½d.
3. £0 10s. 3½d. + 2.
4. £381 19s. 9d. + 17.
5. £5,796 16s. 7¾d. + 53.
6. 12,255.
7. £9 9s. 6¼d.
8. 2,322 pts.
9. 13 qrs. 5 bus. 1 pk. 1 gall.
10. 2,471,040 min.
11. 17 yrs. 10 mths. 1 wk. 1 dy. 22 hrs. 55 min.
12. 699,936 ozs.
13. 1 ton 10 cwt. 2 qrs. 6 lbs. 5 ozs. 11 drs.
14. 26,832 in.
15. 15 mls. 3 furs. 36 pls. 2 yds. 1 ft. 4 in.
16. 122,829¾ sq. ft.
17. 187 acs. 1 rd. 4 pls. 4 yds.

TEST CARDS—*cont.*

Card 15.

1. £2,217 12s. 6d.
2. £138,088 17s.
3. £0 10s. + 8.
4. £49 4s. 3d. + 52.
5. £185 3s. 11½d. + 688.
6. 4,695.
7. £10 1s. 4½d.
8. 2,920 pts.
9. 5 qrs. 2 bus. 1 pk. 1 gall.
10. 2,995,200 min.
11. 4 yrs. 6 mths. 2 wks. 6 dys. 24 min.
12. 483,536 ozs.
13. 1 ton 11 cwt. 1 qr. 1 st. 2 lbs. 13 ozs. 10 drs.
14. 11,304½ yds.
15. 9 mls. 5 furs. 36 pls. 4½ yds. 5 in.
16. 614,960 sq. pls.
17. 7 rds. 2 pls. 3½ sq. yds. 7 ft. 20 in.

Card 16.

1. £824 6s. 10½d.
2. £271,855 14s. 7d.
3. £0 14s. 2½d.
4. £66 1s. 3½d. + 13.
5. £611 6s. 5½d. + 349.
6. 6,689.
7. £11 7s. 9d.
8. 3,130 pts.
9. 19 qrs. 4 bus. 1 pk. 1 pt.
10. 958,500 min.
11. 16 yrs. 7 mths. 3 wks. 4 dys. 5 hrs. 24 min.
12. 440,640 ozs.
13. 2 tons 2 cwt. 1 qr. 12 lbs. 2 oz. 7 drs.
14. 58,017 in.
15. 4 mls. 7 furs. 26 pls. 3 yds. 1 ft. 8 in.
16. 68,361⅔ sq. ft.
17. 65 acs. 1 rd. 9 pls. 15¾ yds.

Card 17.

1. £3,468 13s. 11½d.
2. £163,193 8s. 8d.
3. £0 12s. 11½d.
4. £280 7s. 9¾d. + 10.
5. £2,088 18s. 7d. + 5.
6. 7,761.
7. £4 8s. 10d.
8. 3,994 pts.
9. 5 qr. 7 bus. 3 qts.
10. 575,820 min.
11. 14 yrs. 8 mths. 3 wks. 6 dys. 14 hrs. 9 min.
12. 50,816 ozs.
13. 1 ton 11 cwt. 3 qrs. 10 lbs. 9 ozs. 1 dr.
14. 253,440 in.
15. 27 mls. 27 pls. 1½ yds. 1 ft. 11 in.
16. 242,574⅔ sq. ft.
17. 231 pls. 3¼ sq. yds. 7 sq. ft. 71 in.

Card 18.

1. £1,615 8s. 10d.
2. £364,429 6s. 5½d.
3. £0 14s. 0¼ + 1.
4. £135 18s. 0½d. + 5.
5. £620 6s. 1¾d. + 118.
6. 19,317.
7. £15 1s. 9½d.
8. 7,160 pts.
9. 9 qrs. 6 bus. 1 pk. 1 qt.
10. 1,068,531 min.
11. 11 yrs. 1 mth. 5 dys. 17 hrs. 36 min.
12. 191,952 ozs.
13. 1 ton 11 cwt. 3 qrs. 10 lbs. 10 ozs. 5 drs.
14. 191,934 in.
15. 26 mls. 5 furs. 30 pls. 2 yds.
16. 27,878,400 sq. yds.
17. 8 sq. pls. 2 yds. 4 ft. 108 in.

Card 19.

1. £4,296 10s. 7½d.
2. £32,431 8s. 7½d.
3. £0 14s. 0½d. + 4d.
4. £303 3s. 6½d. + 2.
5. £1,358 12s. 2½d. + 136.
6. 1,182.
7. £3 2d. 2½d.
8. 7,594 pt.
9. 5 qrs. 6 bus. 3 pks. 1 gall. 2 qts.
10. 1,281,600 min.
11. 2 yrs. 9 mths. 3 wks. 2 dys. 6 hrs. 12 min.
12. 297,712 ozs.
13. 3 tons 14 cwt. 3 qrs. 11 lbs. 2 oz.
14. 58,122 in.
15. 143 mls. 5 furs. 31 pls. 2½ yds. 2 ft. 9 in.
16. 717,160 pls.
17. 23 pls. 3½ yds. 97 in.

Card 20.

1. £2,948 13s. 9d.
2. £383,331 12s. 2½d.
3. £1 19s. 1d. + 4.
4. £164 2s. 4d. + 22.
5. £1,261 7s. 4¾d. + 193.
6. 3,194.
7. £1 5s. 3½d.
8. 14,330 pts.
9. 4 qrs. 1 gall. 2 qts.
10. 2,964,540 min.
11. 4 yrs. 5 mths. 1 wk. 2 dys. 11 hrs. 24 min.
12. 20,879 lbs.
13. 1 ton 11 cwt. 2 qrs. 11 lbs. 8 ozs. 11 drs.
14. 4,242½ yds.
15. 22 mls. 4 furs. 15 pls. 4½ yds.
16. 157,632¾ ft.
17. 707 sq. yds. 6 ft. 28 in.

Card 21.

1. £2,896 17s. 8½d.
2. £131,423 2s. 8d.
3. £1 5s. 11d. + 4d.
4. £128 7s. 0d. + 10.
5. £1,524 4s. 5½d. + 95.
6. 5,210.
7. £7 3s. 4½d.
8. 3,194 pts.
9. 7 qrs. 6 bus. 2 pk. 1 gall. 3 qts. 1 pt.

TEST CARDS—*cont.*

Card 21—*cont.*

10. 2,479,697 min.
11. 10 yrs. 6 mths. 12 hrs. 31 min.
12. 134,405 ozs.
13. 3 tons 14 cwt. 1 st. 5 lbs. 14 ozs.
14. 42,990 in.
15. 234 mls. 12 pls.
16. 512,491 pls.
17. 72 ac. 2 rds. 8 pls. 15 yds. 4 ft.

Card 22—*cont.*

10. 1,260,000 min.
11. 7 yrs. 5 mths. 1 wk. 3 dys. 22 hrs. 17 min.
12. 28,560 ozs.
13. 5 tons 10 cwt. 1 qr. 1 lb. 4 oz.
14. 11,476½ ft.
15. 49 mls. 7 furs. 4 pls. 1 yd. 6 in.
16. 5,300,046 in.
17. 3 mls. 55 acs. 3 rds. 29 pls.

Card 23.

1. £9,216 3s. 6¾d.
2. £221,999 0s. 1½d.
3. £1 5s. 6½d.
4. £44 7s. 1d. + 12.
5. £1,682 19s. 8½d. + 90.
6. 9,293.
7. £2 16s. 6½d.
8. 5,010.
9. 2 qrs. 2 bus. 3 pks. 1 gall. 1 qt.
10. 1,513,440 min.
11. 3 yrs. 6 mth. 2 wks. 8 hrs. 18 min.
12. 32,688 ozs.
13. 8 tons 10 cwt. 3 qrs. 1 lb. 9 oz.
14. 20,714½ ft.
15. 293 ml. 1 fur. 19 pls. 4½ yds.
16. 17,292 yds.
17. 1 sq. ml. 182 acs. 3 rds.

Card 24.

1. £1,842 6s. 6¾d.
2. £441,711 17s. 3¾d.
3. £1 19s. 5¾d. + 1.
4. £16 7s. 6½d. + 53.
5. £1,626 17s. 9½d. + 270.
6. 10,289.
7. £5 5s. 7¾d.
8. 7,816.
9. 5 qr. 7 bus. 1 gall.
10. 1,260,780 min.
11. 1 yr. 1 mth. 3 wks. 4 dys. 7 hrs. 21 min.
12. 31,766 lbs.
13. 11 tons 12 cwt. 1 st. 2 lbs. 1 oz.
14. 42,282 in.
15. 17 mls. 5 furs. 1 pl. 1½ yds. 2 ft. 10 in.
16. 5,256,360 in.
17. 20 acs. 2 rds. 28 pls. 1 yd.

Card 25.

1. £3,428 2s. 2½d.
2. £332,545 4s.
3. £0 18s. 9½d.
4. £323 3s. 11⅔d. + 9.
5. £1,086 17s. 9¾d. + 710.
6. 11,554.
7. £11 1s. 0½d.
8. 6,986 pts.
9. 17 qrs. 5 bus. 1 pk. 2 qts. 1 pt.
10. 1,512,200 min.
11. 1 yr. 9 mths. 2 wks. 6 dys. 15 hrs. 12 min.
12. 8,467 lbs.
13. 3 tons 4 cwt. 1 st. 8 lbs.
14. 134,674 in.
15. 591 pls. 3¾ yds. 1 ft. 8 in.
16. 103,478½ ft.
17. 375 acs. 34 pls. 11½ yds.

Card 26.

1. £3,486 2s.
2. £272,612 2s. 8½d.
3. £3 3s. 7¾d.
4. £228 14s. 6¾d. + 21.
5. £1,836 14s. 8½d. + 154.
6. 14,462.
7. £9 7s. 10¾d.
8. 2,536 pts.
9. 25 qrs. 3 bus. 1 gall. 3 qts. 1 pt.
10. 2,167,200 min.
11. 5 mths. 1 wk. 1 dy. 7 hrs. 22 min.
12. 183,647 ozs.
13. 1 ton 19 cwt. 3 qrs. 7 lbs. 6 ozs.
14. 48,432 in.
15. 64 mls. 6 furs. 36 pls. 3 yds.
16. 561,600 pls.
17. 105 sq. pls. 18¾ yds. 6 ft. 25 in.

Card 27.

1. £1,460 13s. 7½d.
2. £522,223 10s. 10d.
3. £2 6s. 2¾d. + 3.
4. £44 9s. 2d. + 42.
5. £292 8s. 8½d. + 322.
6. 15,494.
7. £3 17s. 1½d.
8. 2,874 pts.
9. 2 qrs. 2 bus. 3 pks. 2 qts.
10. 555,420 min.
11. 9 mths. 20 hrs. 9 min.
12. 1,736 lbs.
13. 32 st. 1 lb. 13 ozs. 8 drs.
14. 241,239 in.
15. 591 pls. 3¾ yds. 1 ft. 8 in.
16. 522,768 in.
17. 36 acs. 2 rds. 5 pls. ¾ yd.

Card 28.

1. £2,242 14s. 10d.
2. £71,553 9s. 6¾d.
3. £1 19s. 2¾d. + 5.
4. £63 15s. + 29.
5. £286 10s. 8½d. + 349.
6. 16,473.
7. £14 10s. 2d.
8. 4,290 pts.
9. 5 qrs. 7 bus. 1 gall. 1 pt.
10. 5,292,016 min.
11. 1 yr. 3 wks. 2 dys. 2 hrs. 1 min.
12. 8,793 lbs.
13. 39 cwt. 3 qrs. 8 lbs. 12 ozs. 15 drs.
14. 60,858 in.
15. 49 mls. 4 furs. 26 pls. 3 yds. 2 ft.
16. 38,801 in.
17. 3 mls. 330 acs. 1 rd.

TEST CARDS—*cont.*

Card 29.

1. £1,802 4s. 10¾d.
2. £64,477 5s. 7½d.
3. £1 18s. 4¼d. + 9.
4. £333 13s. 5¼d. + 6.
5. £1,201 15s. 2½d. + 109.
6. 17,477.
7. £20 8s. 4d.
8. 1,722 pts.
9. 25 qrs. 3 bus. 1 pk. 1 gall. 1 pt.
10. 1,281,600 min.
11. 1 yr. 2 mths. 3 wks. 6 dys. 16 hrs. 1 min.
12. 286,940 drs.
13. 78 tons 13 cwt. 2 qrs. 2 lbs.
14. 2,344,354 in.
15. 399 chns. 2 ft. 9 in.
16. 16,909¾ yds.
17. 132 acs. 11 pls. 1¼ yds.

Card 30.

1. £3,938 18s. 10½d.
2. £109,858 14s. 8¾d.
3. £1 4s. 4d.
4. £63 1s. 6½d. + 12.
5. £763 19s. 1½d. + 192.
6. 18,481.
7. £5 18s. 5½d.
8. 6,242 pts.
9. 2 qrs. 2 bus. 3 pks. 1 gall. 3 qts.
10. 3,075,420 min.
11. 1 yr. 5 mths. 2 wks. 3 dys. 2 hrs. 41 min.
12. 1,744 ozs.
13. 31 st. 12 lbs. 3 oz. 11 drs.
14. 27,804 in.
15. 9,567 mls. 7 furs. 2 chns.
16. 150,539 pls.
17. 72 acs. 32 pls. 20 yds. 4 ft.

Card 31.

1. £354 4s. 2d.
2. £121,169 13s. 4½d.
3. £1 18s. 1¼d. + 4.
4. £31 1s. 3¼d.
5. £158 2s. 11½d.
6. 12,594.
7. £2 19s. 3¼d.
8. 5,906 pts.
9. 7 qrs. 3 bus.
10. 1,582,920 min.
11. 1 yr. 8 mths. 1 wk. 0 dys. 14 hrs. 44 min.
12. 64,064 ozs.
13. 53 tons 5 cwt. 1 qr. 6 lbs.
14. 20,055 ft.

Card 32.

1. £1,142 3s. 10½d.
2. £325,896 11s. 3d.
3. £1 4s. 8¾d. + 9.
4. £96 3s. 9¼d.
5. £175 17s. 4¼d.
6. 3,913.
7. £3 14s. 0¼d.
8. 3,592 pts.
9. 19 qrs. 4 bus. 1 pk. 1 gall. 1 qt. 1 pt.
10. 1,421,280 min.
11. 1 yr. 1 mth. 2 wks. 4 dys. 22 hrs. 26 min.
12. 31,389 ozs.
13. 45 st. 11 lbs. 2 ozs. 11 drs.

TEST CARDS—*cont.*

Card 31—*cont.*

15. 113 mls. 4 furs. 24 pls. 2 ft. 7 in.
16. 17,408 yds.
17. 18 sq. pls. 5½ yds. 4 ft. 39 in.

Card 32—*cont.*

14. 6,902½ yds.
15. 402 chns. 3 pls. 4½ yds. 2 ft.
16. 25,587⅜ ft.
17. 112 sq. pls. 5 ft. 73 in.

Card 33.

1. £691 15s. 4¼d.
2. £128,179 13s. 3d.
3. £2 2s. 11¾d. + 2.
4. £73 4s. 3¼d.
5. £685 7s. 4d.
6. 14,582.
7. £4 17s. 3d.
8. 10,072 pts.
9. 11 qrs. 22 bus. 1 pt.
10. 633,600 min.
11. 1 yr. 3 mths. 3 wks. 1 dy. 10 hrs. 43 min.
12. 3,430 lbs.
13. 8 tons 10 cwt. 3 qrs. 8 lbs. 2 ozs.
14. 28,884 ft.
15. 3 mls. 7 furs. 6 pls. 5 yds. 2 in.
16. 156,442½ ft.
17. 136 mls. 323 acs. 2 rds. 4 pls.

Card 34.

1. £352 8s. 1½d.
2. £97,255 7s. 6d.
3. £0 3s. 1¾d. + 3.
4. £78 2s. 4¼d.
5. £289 3s. 3¾d.
6. 4,969.
7. £5 12s. 3d.
8. 7,656 pts.
9. 3 qrs. 2 bus. 2 pks. 2 qts.
10. 1,543,620.
11. 1 yr. 7 mth. 3 wk. 58 min.
12. 33,371 ozs.
13. 3 tons 15 cwt. 1 qr. 1 st. 11 lbs. 13 ozs. 2 drs.
14. 58,502 in.
15. 11 mls. 2 furs. 18 pls. 1 yd. 1 ft. 7 in.
16. 626,476 sq. in.
17. 64 acs. 3 rds. 25 pls. 22¾ yds.

Card 35.

1. £538 9s. 4d.
2. £144,407 9s. 10½d.
3. £0 7s. 2¼d. + 5.
4. £72 12s. 6½d.
5. £88 9s. 7¼d + 378.
6. 17,654.
7. £2 11s. 4d.
8. 8,122 pts.
9. 17 qrs. 4 bus. 1 gall. 3 qts.
10. 574,560.
11. 1 yr. 10 mths. 6 dys. 23 hrs. 41 min.
12. 422,776 drs.
13. 15 tons 17 cwt. 3 qrs. 1 st. 12 ozs. 12 drs.
14. 341,979 in.
15. 18 mls. 2 pls.
16. 416,567 pls.
17. 34 pls. 27½ yds. 2 ft. 136 in.

EXAMINATION TESTS.

Card 1.

Boys.

1. £148 5s. 10d.
2. £13 17s. 7¼d. + 13.
3. 3 ac. 2 rds. 15 pls. 7¼ yds. 6 ft.
4. £32 2s.

Girls.

1. £695 15s. 7½d.
2. 6,672.
3. £954,466 12s. 2d.
4. £74 11s. 5¼d. + 3.

Card 2.

Boys.

1. £21,064 3s. 1½d.
2. 57.
3. £49 10s. 2d. + 305.
4. 7 mls. 7 furs. 1 ch. 1 pl. 2½ yds.

Girls.

1. £1,581 1s. 1¼d.
2. 561,232 ozs.
3. £7 10s. 6d.
4. £320,075 11s. 8d.

Card 3.

Boys.

1. 4 mls. 7 furs. 6 chs. 1 pl. 4½ yds. 2 ft. 2 in.
2. £331 9s. 7d. + 238.
3. 49.
4. £42,845 11s. 6¾d.

Girls.

1. 9 yrs. 35 dys. 3 hrs.
2. £89,482 6s. 8½d.
3. £18 19s. 10d. + 243.
4. £5 3s. 2½d.

Card 4.

Boys.

1. 86,761,044 sq. in.
2. £49,374 2s. 8½d.
3. £12,705 17s. 11d. + 4.
4. 1½.

Girls.

1. £3 7s. 4¼d.
2. 23 qrs. 4 bus. 2 pks.
3. £29 9s. 6¾d. + 274.
4. £133 1s. 5½d.

Card 5.

Boys.

1. £76 18s. 11½d.
2. £539,073 3s. 9d.
3. 2 wks. 1 dy. 5 hrs. 34 min.
4. £84 19s. 9d. + 13.

Girls.

1. £30,479 4s. 0¾d.
2. 18,160.
3. 142 mls. 34 pls. 5 yds. 2 ft. 4 in.
4. £231 6s. 0¾d. + 10.

Card 6.

Boys.

1. 987.
2. £36,815 10s. 11½d.
3. 3,906 bus. 1 pk.
4. 504.

Girls.

1. 679 guins. 7s. 4½d.
2. £151 3s. 4½d.
3. 70,208 sq. yds.
4. 42 girls.

Card 7.

Boys.

1. 98.
2. 4 acs. 2 rds. 18 pls. 15½ yds.
3. £1,842 11s. 7¾d. + 185.
4. £24,185 10s. 5d.

Girls.

1. 30,161 steps.
2. 2s. 4d.
3. £7,434 12s.
4. £1 12s. 11¼d. + 81.

Card 8.

Boys.

1. £9 11s. 0½d.
2. £1 15s. 3d.
3. 976 qrs. 4 bus. 2 pks.
4. 9,891.

Girls.

1. £3,135 12s. 3½d.
2. 61 farths. (or 1s. 3¼d.)
3. 12,387,672 in.
4. 2s.

Card 9.

Boys.

1. £13,068.
2. £38 1s. 3¾d. + 18.
3. £5,011 4s. 10½d.
4. 45 tons 19 cwt. 2 qrs. 1 st. 6½ lbs.

Girls.

1. £1,148 3s.
2. £9 14s. 1¾d. + 61.
3. 1,256 tons 7 cwt.
4. £71 2s. 6d.

Card 10.

Boys.

1. £12 4s. 6¼d.
2. 6s. 6d.
3. £1,875 2s. 4½d.
4. 38,724 sq. in.

Girls.

1. £57 15s. 0¾d.
2. 2,029.
3. £15 3s. 4½d.
4. 2 yrs. 323 dys. 7 hrs. 44 min. 2 sec.

Card 11.

Boys.

1. £87 5s. 6¼d.
2. 22 times.
3. £6,259 10s. 7½d.
4. 111,776 ozs.

Girls.

1. 674 chains.
2. 8,403.
3. 2,678,400 sec.
4. £940 9s. 3¼d. + 54.

Card 12.

Boys.

1. £77 16s. 0d.
2. 4,000 hf. pts.
3. 29 lbs.
4. £7,064 9s. 6d.

Girls.

1. 7 stones.
2. £3 1s. 4¼d.
3. 114 guineas.
4. £13,546 10s. 5¼d.

EXAMINATION TESTS—*cont.*

Card 13.

Boys.

1. 9,008 hf. guineas.
2. £232 17s. 4¼ + 69.
3. £3 0s. 10d.
4. 1,745,568 inches.

Girls.

1. £2 5s. 4½d.
2. £119,692 0s. 7½d.
3. £2,631 11s. 6¾d. + 15.
4. 16,856 hf. lbs.

Card 14.

Boys.

1. £136 2s.
2. £97 19s. 11½d. + 612.
3. 6,195,200 sq. yds.
4. £9 15s. 11½d.

Girls.

1. 4.
2. 193,074.
3. £8,824 11s. 3d.
4. £3 4s. 2¼d.

Card 15.

Boys.

1. 3 sq. mls.
2. £474 11s. 6d.
3. £417 4s. 6¼d.
4. 371.

Girls.

1. £2,225 4s.
2. 2 yrs. 311 dys. 16 hrs.
3. 252.
4. £16,632 1s. 0½d. + 12.

Card 16.

Boys.

1. £1 8s.
2. £5 8s. 8½d. + 26.
3. £6,208 5s.
4. 137,984.

Girls.

1. £52 11s. 9d.
2. £88 9s. 1¾d. + 61.
3. 1 mile 4 furs. 25 pls. 1½ yds. 6 in.
4. 453.

Card 17.

Boys.

1. 13.
2. £76,058 1s. 3d.
3. 124.
4. 530,100 in.

Girls.

1. 2s. 10d.
2. £19 14s. 8¼d.
3. 1,440.
4. £4,214 13s. 6d.

Card 18.

Boys.

1. £8 18s. 1½d.
2. £73 18s. 10d.
3. 139,392,000.
4. £21,368 13s. 6¼d.

Girls.

1. 137.
2. 168.
3. 3,908 qrs. 7 bus. 3 pks. 1 gall. 1 qt.
4. £65 6d. 4¾d.

Card 19.

Boys.

1. £7 5s. 6d.
2. 75,525 15s. 7½d.
3. 11,200.
4. £588 16s. 5½d. + 16.

Girls.

1. 2 mls. 3 furs. 3 pls. 3½ yds.
2. £28 11s. 5d. + 6.
3. £15,409 6d. 9½d.
4. 16,940.

Card 20.

Boys.

1. £1 1s. 3½d.
2. £505 7s. 0¾d. + 78.
3. 90 chains.
4. £6,486 14s. 4½d.

Girls.

1. £1,475 2s. 1½d.
2. 2 cwt. 1 st. 9 lbs. 8 ozs.
3. £55 17s. 9d. + 5.
4. 273.

Card 21.

Boys.

1. £98 1s. 10½d.
2. 189 chains 8 yds. 2 ft.
3. £7 9s. 4d.
4. £21,379 16s. 9d.

Girls.

1. 31,622,400.
2. 14,113,459.
3. £85 2s. 9d. + 5.
4. 1,594,656.

Card 22.

Boys.

1. 507.
2. 6,272.
3. £61 2s. 10¾d. + 9.
4. 9,292,800 sq. yds.

Girls.

1. 19 tons 19 cwt. 2 qrs.
2. 3,978 3s. 10½d.
3. £43 12s. 0d.
4. £3 5s. 6¼d.

Card 23.

Boys.

1. 7,680 oz.
2. 200.
3. £36 7s. 2d. + 322.
4. 15,085 19s. 3½d.

Girls.

1. £13,956 0s. 1d.
2. 388.
3. 2,304.
4. £1 17s. 4½d.

Card 24.

Boys.

1. £65 7s. 7¼d. + 215.
2. 86,400.
3. £53 14s. 0d.
4. £37,697 11s. 3d.

Girls.

1. 1,440.
2. £82,032 17s. 11d.
3. 19.
4. £1 17s. 4½d.

EXAMINATION TESTS—*cont.*

Card 25.

Boys.

1. £5,445.
2. £33,542 8s. 6½d.
3. £1 4s.
4. £1 1s. 2½d.

Girls.

1. £39 11s. 6½ + 2.
2. £100 7s. 6d.
3. 2,943 qrs. 2 bus. 1 gall. 2 qts.
4. £1,673 16s. 7½d.

Card 26.

Boys.

1. £587 2s. 10½d.
2. The chains by 6 furs. 38 pls.
3. £8 13s. 5¾d. + 167.
4. 6,272.

Girls.

1. £128 9s. 6d.
2. 1 rd. 11 pls. ¾ yd. 1 ft. 128 in.
3. £1,567 19s. 1½d.
4. £39 18s. 8d.

Card 27.

Boys.

1. 57.
2. 7,948,800.
3. £23,603 5s. 9d.
4. 992 guins. 1s. 4d.

Girls.

1. £403 16s. 11¼d.
2. £760 10s. 4½d.
3. 9,384 bus. 1 pk. 1 gall.
4. 11 lbs. 6½ ozs.

Card 28.

Boys.

1. £33,346 9s. 8d.
2. 17s. 11¾d.
3. 3,792.
4. £6 16s. 10½d.

Girls.

1. £139 5s. 6d.
2. £1,569 19s. 9d.
3. 3 score.
4. 11,200.

Card 29.

Boys.

1. 1,209,600 sec.
2. £78 16s. 11¼d. + 111.
3. £5 1s. 8d.
4. £210 11s. 3d.

Girls.

1. 21.
2. £88,114 16s. 4½d.
3. £359 10s.
4. £231 18s. 1¾d. + 7.

Card 30.

Boys.

1. £170 12s. 9¾d. + 10.
2. 132,048.
3. 61.
4. 81,625½.

Girls.

1. 47,696 6s. 4¾d.
2. 2,931.
3. £162 16s. 8½d. + 22.
4. 5 tons 5 cwt. 9 lbs. 8 ozs. 8 drs.

Card 31.

Boys.

1. 40 guineas.
2. £72 9s. 10d. + 50.
3. 22 acs. 3 rds. 33 pls. 2¾ yds. 1 ft.
4. 19s. 3½d.

Girls.

1. £1,800 1s. 2d. + 8.
2. 6 yrs. 276 dys. 6 hrs.
3. £41,591 14s. 5½d.
4. 64,656.

Card 32.

Boys.

1. £182 5s. 4½d. + 32.
2. 4,410.
3. 13 tons 19 cwt. 2 lbs.
4. £77,477 18s. 8d.

Girls.

1. £4,814 6s. 10¾d.
2. 26,555.
3. 293 qrs. 1 gall. 3 qts.
4. £2 7s. 9¼d.

Card 33.

Boys.

1. 1,188,000.
2. £60 14s. 5¾d. + 87.
3. £56 3s. 9d.
4. £7,342 4s. 7d.

Girls.

1. 9,346.
2. £1,810 15s. 4½d.
3. £342 1s. 3½d. + 29.
4. £15 13s. 4d.

Card 34.

Boys.

1. 300.
2. £1 1s. 3¾d.
3. £38,988 1s. 8d.
4. £63 12s. 9¼d. + 30.

Girls.

1. 48,024.
2. £93 16s. 3½d. + 4.
3. 6.
4. £4,416 10s. 11¼d.

Card 35.

Boys.

1. £13 13s.
2. £10,384 13s. 11½d.
3. £1,046 11s. 9¾d.
4. 21 mls. 6 furs. 5 pls. 4½ yds.

Girls.

1. 1,056.
2. £11,264 0s. 6d.
3. £29 5s. 0¾d. + 63.
4. 37 chns. 19 yds. 1 ft.

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